DIRECTOR
Dr Waseem Shahzad
PhD Approved Supervisor
Professor
PhD (CS), NUCES, Islamabad (2010)
MS (CS), NUCES, Islamabad (2008)
MIT, UAAR, Rawalpindi (2004)

The Islamabad campus is situated along the Srinagar Highway, offering a breathtaking vista of the picturesque capital city renowned for its beauty and tranquility. Nestled in such an exquisite locale, the campus provides a captivating and delightful view of the city.

Spanning over 15 acres of land, the campus is strategically located in the academic heart of the city. Its infrastructure, including the newly constructed eight-story academic block, reflects a futuristic approach. With a steadily expanding covered area, the campus's academic programs are continuously evolving.

Our campus boasts a highly qualified, fully committed, and professionally stimulated faculty dedicated to academic excellence. Our faculty members excel in teaching competence and are adept at integrating the latest advancements in science and technology into their instruction. They are accomplished researchers, contributors, and developers in their respective fields, conducting research in areas such as Intelligent Networks, Software Testing, Software Engineering, Machine Intelligence, Image Processing, Neural Networks, Embedded Systems, RF Systems, and Control Systems.

We offer undergraduate programs in Computer Science, Software Engineering, Artificial Intelligence, Data Science, Cyber Security, Electrical Engineering, Robotics, Business Administration, Analytics, and Accounting and Finance. Additionally, we provide Master of Science and Doctor of Philosophy programs in Computer Science, Software Engineering, Artificial Intelligence, Data Science, Computer Networks and Security, Electrical Engineering, and Management Sciences.

Our graduates are highly sought after by both national and multinational corporations, holding prominent positions in companies such as Microsoft, Oracle, NCR, LMKR, IBM, Telenor, and Huawei. The campus is equipped with state-of-the-art facilities for both academic and extracurricular activities. Our spacious and well-equipped computer and engineering labs provide students with practical training, while audio-visually supported and well-furnished classrooms offer an optimal learning environment.

To promote physical fitness and relaxation, we offer sports facilities for indoor and outdoor games, including cricket, football, badminton, table tennis, volleyball, and chess. We also organize healthy programming competitions and events, such as NASCON, a national-level competition highly regarded by both industry and educational institutions across the country.

With over 24 student societies and clubs, we foster co-curricular activities to instill a sense of responsibility and leadership potential in our students.

We look forward to welcoming you to our campus and witnessing the vibrant atmosphere of academic excellence and innovation.

Programs offered at Islamabad Campus:

Bachelor of Business Administration

Bachelor of Science (Accounting and Finance)

Bachelor of Science (Artificial Intelligence)

Bachelor of Science (Business Analytics)

Bachelor of Science (Computer Science)

Bachelor of Science (Computer Engineering)

Bachelor of Science (Cyber Security)

Bachelor of Science (Data Science)

Bachelor of Science (Electrical Engineering)

Bachelor of Science (Financial Technology)

Bachelor of Science (Software Engineering)

Master of Business Administration

Master of Science (Artificial Intelligence)

Master of Science (Business Analytics)

Master of Science (Cyber Security)

Master of Science (Computer Science)

Master of Science (Data Science)

Master of Science (Electrical Engineering)

Master of Science (Software Engineering)

Doctor of Philosophy (Computer Science)

Doctor of Philosophy (Electrical Engineering)

Doctor of Philosophy (Management Sciences)

Doctor of Philosophy (Software Engineering)

1. Artificial Intelligence and Machine Learning Lab

Introduction

At AIM Lab, we're dedicated to pushing the boundaries of AI and ML across a range of core research areas. We are specialized in advancing artificial intelligence (AI) and machine learning (ML) through research. These include Natural Language Processing (NLP), where we work on understanding and processing human language for tasks like chatbot development, LLM fine-tuning and deployment.

Deepfakes, a rapidly evolving area of AI, offer both opportunities and challenges. Our deepfakes research is focused on understanding and mitigating the risks associated with manipulated media. In today's era where generative AI poses severe threats, we aim to combat misinformation by developing advanced detection algorithms and investigating authentication and verification methods. Our efforts range from developing illumination-based techniques to deep learning-based detection algorithms.

Committed to ethical AI, we ensure fairness and transparency in all our endeavors. Our research extends to sustainable computing, healthcare applica-tions, education, and industry collaborations. Join us as we promote innovation and contribute to the scientific community.

Recent Collaborations

Protect Your Finances in the Deepfake Age: Our Research Leads the Way

Financial institutions are under siege from a new kind of fraudster: deepfakes. These hyper- realistic forgeries can manipulate videos and voices, potentially enabling criminals to impersonate customers and steal funds.

At our research lab, we're on the frontlines of this battle.

Our project, "Mitigating Financial Fraud in the Age of Deepfake Technology," is developing robust detection and prevention methods to safeguard your financial security.

Here's what we're working on:

Unmasking Deepfakes

We're researching cutting-edge techniques to identify deepfakes in real- time, analyzing video and audio patterns to expose these forgeries.

Building a Secure Future

We're developing preventative measures for financial institutions, creating a multi-layered defense against deepfake attacks.

For more information visit the website link: http://isb.nu.edu.pk/aim/

Current Project

Mitigating Financial Fraud in the Age of Deepfake Technology: Developing Robust Detection and Prevention Methods

Funding amount: PKR 1.494 million

Research Group Members

1. Dr. Muhammad Ishtiaq
2. Dr. Hasan Mujtaba
3. Dr. Hammad Majeed
4. Dr. Waseem Shahzad
5. Dr. Mirza Omer Beg
6. Dr. Naveed Ahmed
7. Mr. Hassan Raza
8. Mr. Owais Idrees
9. Mr. Adil Majeed
10. Ms. Saira Qamar

2. Parallel Computing and Networks (PCN) Lab

The Parallel Computing and Networks research group (PCN) is conceived based on the interconnected research areas of the founders in 2014 including parallel and distributed computing, as well as IP, wireless, and ad-hoc networks. In recent years, the group has also broadened its research agenda to encompass newfields, such as cyber security, temporal information retrieval, social network analysis, and online privacy concerns. By leveraging our expertise in these diverse domains, we aim to drive advances in computing and networking that will benefit society and contribute to the frontiers of research in these rapidly evolvingfields.

The team 'Patronus' from the PCN Research Lab Islamabad has claimed the winning title of Pakistan's first 5G Innovation Hackathon powered by Jazz with Code for Pakistan (CfP) and Huawei serving as the implementation and technology partners, respectively.

Research Collaborations

PCN has enjoyed a thriving partnership with the Distributed and Parallel Systems (DPS) research group at the University of Klagenfurt in Austria. This collaboration, financed by the OeAD-GmbH/ICM on behalf of the Federal Ministry of Science, Research and Economics – BMWFW, Austria, provides invaluable international exposure to PCN research students at NUCES, Islamabad. Through this collaboration, students receive expert guidance from esteemed researchers in the field of parallel and distributed computing.

Based on the accreditation and curriculum development activities of the PCN members, we are participating in an Erasmus Capacity Building Project, i.e., Strategic Support for Accreditation of Programs and Internationalization at South Asian Higher Education Institutes / SSAPI (2021- 2023) on behalf of National University of Computer and Emerging Sciences, Islamabad. Pakistan.

Current Projects

NRPU: NAS-News Analytics Service using Spatiotemporal Information

Funded by HEC NRPU 2021

The article discusses how human decision-making depends on cognitive processing, but people often ignore information that conflicts with their beliefs. Web news documents provide rich cognitive information that can be useful for forming policies, but the geographical and temporal patterns in the collection of news reports are important for building a cognitive information retrieval system. The study proposes novel approaches to determine the geo-temporal specificity and focus of news documents, including defining geo-temporal classes, engineering news geo-temporal features, and proposing new text classification methods. Data science and machine learning approaches will be used to detect and classify impactful news, and the overall findings will demonstrate how valuable geo-temporal insights can enhance the performance of information retrieval systems. The proposed system will map events based on their severity onto a map, which can be used to guide drones or personnel on the ground.

Artificial Intelligence Based Network Anomaly Detection System Funded by National Engineering and Scientific Commission Pakistan

The increasing sophistication of cyber-attacks has made it difficult to detect and prevent them using traditional methods such as signature-based intrusion detection systems. As a result, more advanced techniques like Artificial Intelligence (AI) are being developed to identify suspicious activities in real- time. However, most research in this field has focused on synthetically generated data, which does not fully reflect the complexity of real-world network traffic. Therefore, this research presents an experiment where a network infrastructure equipped with a honeypot was deployed to capture real-world network data. By using real-world data, the researchers were able to demonstrate the effectiveness of AI models in detecting threats and preventing network disruptions, which contributes to the growing body of research on the application of AI in network security.

Heuristics Analysis of Malwares in Sandbox Environment

Funded by National Engineering and Scientific Commission Pakistan

Currently, malware has been a critical threat that attacks multiple platforms such as Windows, Android, and IoT etc. However, with the evolution of modern and sophisticated malware categories, it has now become difficult to differentiate between malware and non-malware creating a challenging task to examine the behavior of malware applications. Due to the limitations of static-based detection mechanisms, we propose a heuristic machine learning-based malware classification and detection technique that utilizes the static and dynamic features to increase the malware detection rate. The dataset employed in the study comprises 8400 malware applications, which were collected using different platforms. Experimental results show that the proposed malware detection and classification mechanism is able to detect and classify unknown malicious applications into malware and non-malware categories using several machine learning algorithms such as SVM, Random Forest, and XGBoost. Moreover, it has been noticed that data from network activities can be used to classify and identify malware more appropriately. The outcomes of the study illustrate that random forest has outperformed by attaining an accuracy of 0.96 for malware classification.

Research Group Members:

1. Dr. Muhammad Arshad Islam
2. Dr. Muhammad Aleem
3. Dr. Muhammad Azhar Iqbal
4. Dr. Subhan Ullah
5. Mr. Asif Muhammad
6. Mr. Ameen Chilwan

For more information visit the website link: www.pcn.net.pk

3. Data Insight Research Lab

The Data Insight Research Lab is dedicated to the overarching goal of advancing the field of data science and artificial intelligence. At its core, the lab endeavours to pioneer the development of robust systems and innovative AI-based models. In pursuit of this mission, the lab focuses on intricate tasks such as knowledge extraction, pattern recognition, generating insights from data by leveraging cutting-edge AI tools, deep learning, and large language models. In addition to its technological pursuits, the Data Insight Research Lab serves as a dynamic platform for fostering collaboration and cultivating a vibrant research culture by engaging academia with local and international industry.

Research Spectrum

The primary focuses of the lab is to do research in following areas along with relevant projects.

Core Research Areas

1. Data Science
2. Generative AI and LLMs
3. Data Engineering
4. Data Mining and Machine Learning
5. Computer Vision and Deep Learning
6. Social Data Analytics

Research Team

The lab has established a strong research team from both industry and academia. The academic research team consists of both international and national researchers plus PhD and Master Students.

Funding Grants

1. National Research Program for Universities (NRPU 2022) (PKR 7,654,500) 2. NESCOM (2022) (PKR 2,000,000)
2. Capacity Building Grant (2020) (PKR 1,375,000)

Faculty Research Support (2020) (PKR. 590,000)Publications

The lab has published one book and more than 120 peer reviewed journals, conferences and workshops papers including in IEEE, ACM, and VLDB. The lab recent research has been published in VLDB Journal and in Information Systems (ranked A* in Computing Research and Education Association CORE), in Expert Systems with Applications (Q1 in Scimago Journal Ranking SJR), and in ICDM (ranked A* conference in CORE).

Current Projects

HEC-NRPU 2021 Grant

Professor Muhammad Asif Naeem as a Principal Investigator (PI) has received National Research Program for Universities (NRPU) 2021 research grant for his project titled "Make Data Useful from Rubble: An AI-based Approach to Digitize Handwritten Medical Prescriptions and to Build a Recommender System". The grant is funded by Higher Education Commission (HEC) of Pakistan. The total funding amount is Rs. 7,108,500/- and the duration of the project is 24 months. As one of the requirements of the grant, a research lab with name Data Insight has been established at the School of Computing, National University of Computer and Emerging Science (NUCES), Islamabad Campus. The project will offer new job opportunities for our research students and open up new research collaboration opportunities with national and international researchers and industry partners in this domain. The graphical overview of the project is given below.

Research Group Members:

1. Dr. Muhammad Asif Naeem
2. Mr. Saad Munir
3. Mr. Hamza Khan
4. Mr. Muhammad Umair

A Funded Project by NESCOM

Professor Dr Muhammad Asif Naeem as a Principal Investigator has received a grant for RAC project funded by NESCOM, Pakistan. The project is about Detecting Fake News using Machine Learning. We propose a bilingual approach for which we will collect bilingual dataset with enhanced number of features e.g., words per sentence, source of the news, domain of the news, language of the text etc. We will not only rely on text-based classification, but we will also go with domain-wise classification (e.g., Politics, Health, World, Sport), source-wise classification, sentiment-based classification, and opinion-based classification. The abstract level execution architecture for the proposed approach is shown below.

Research Group Members:

1. Dr Muhammad Asif Naeem
2. Mr. Muhammad Saad Munir

For more information visit the website link:

http://isb.nu.edu.pk/datainsight/

4. PROTECT Lab

Introduction

PROTECT lab has been established to focus on cross-subject collaboration and provide innovative solutions in the rich field of cyber security. The lab works closely with industrial organizations in Pakistan to design and develop real industrial problems of national significance. Our team focuses on a number of key areas, including: Cyber Threat Intelligence, Advance Persistent Threats (APT), Smart City Governance, Blockchain, and the security to safeguard against cyber-attacks in distributed environment. Our collaborations with industrial partners, including NCCS and Trillium Information Security System (TISS), have further amplified our impact. These partnerships foster the exchange of knowledge, expertise, and resources, enabling us to push the boundaries of innovation in cybersecurity. With NCCS funding, we've been able to expand our research endeavors, undertake ambitious projects, and drive change on anational scale.

Core Research Areas/ Research Foster

1. Cyber Threat Intelligence
2. Critical Infrastructure security
3. Applications of Data Science and Artificial Intelligence in Cyber security
4. Blockchain
5. Smart city Governance
6. Internet of Things Security

Current Projects

Cyber Threat Intelligence

The project focuses on developing key algorithms and techniques that could be seamlessly integrated into any threat intelligence platform as plugins to provide actionable threat intelligence. Output of this project will increase the number of threat intelligence sources and actionable threat intelligence to help different sectors of Pakistan (banking, health, telecom, etc.) to protect their critical infrastructures from any potential threat.

Threat Gator (Intelligence from social media)

Threat intelligence can be gathered from a variety of sources, including social media platforms such as Twitter, blogs, and Reddit. There are multiple sources from which threat intelligence can be gathered and one of these is social media, in particular, Twitter and Reddit. Due to the speed at which information is available on these platforms, social media is not just a networking tool but can be a source for valuable threat intelligence. The challenge that lies here, however, is that this data is in the form of unstructured text and thus has to be manually parsed, analyzed and correlated.

We propose a novel framework for the automation of this task, using a pipeline approach, fine-tuning BERT models for Named Entity Recognition and then for Relationship Extraction to bring this major chunk of threat intelligence available on social media into STIX format. STIX (Structured Threat Information Expression) is a standardized method of sharing threat information in the form of a node graph.

ISO27K1 automation

Revolutionizing Security Audits automate, streamline, and enhance security audits with the cutting-edge "ISO27k1" toolkit. Save time, reduce errors, and ensure compliance with ISO 27001, NIST-SP 800-53, and PCI DSS. Experience project planning, automated asset inventory, risk assessments, and treatment. Access the latest standards with the chatbot and generate comprehensive reports.

A Zero-Trust Framework for Secure Remote Access

Traditional Virtual Private Net-works (VPNs) generally experi-ence performance, latency, and security issues, especially when supporting secure remote access to applications in industries like smart manufacturing and health. To subside such issues, we provide a Zero Trust Network Access (ZTNA) framework, which is UDP-based and guarantees speed and effectiveness. It uses a centralized management interface conformed to various network environments and helps provide secured access to mission-critical applications for increased operational agility. It proposes a novel framework based on Zero Trust (ZT) to achieve efficiency, security, and utility. It aims to meet the emerging demands of modern, industrialized network environments that offer secure access.

Research Group Members:

1. Dr Muhammad Asim
2. Dr Qaiser Shafi
3. Mr. Abdullah Abid
4. Mr. Mehmood ul Hassan

5. System Analysis & Flexible Electronics (SAFE) Lab

Introduction

The system analysis and flexible electronics (SAFE) lab was established in 2022. Focus of the lab is on the design, analysis, and implementation of digital systems using machine/deep learning and field programmable gate arrays (FPGAs), design and fabrication of flexible electronics-based circuits and sensors.

Collaborations

1. Center for Advanced Electronics and Photovoltaic Engineering (CAEPE), International Islamic University (IIU), Islamabad, Pakistan
2. Hamad Bin Khalifa University, Qatar
3. Harbin Engineering University, China
4. Rawalpindi Medical University (RMU), Rawalpindi, Pakistan
5. National Engineering and Scientific Commission (NESCOM), Islamabad, Pakistan

Current Project

A flexible sensor for the detection of liver diseases, PKR 5.4 million, Funded by Higher Education Commission (HEC), Pakistan under the National Research Program for Universities (NRPU) initiative.

Research Group Members:

1. Dr. Shahzad Saleem
2. Dr. Muhammad Awais
3. Dr. Arshad Hassan Khan
4. Syed Moiz Hussain
5. Mr. Waqar Ahmad
6. Mr. Ghayas Tahir

6. Mars Research Lab

Marine and Aerial Robotics System (MARS) research lab is established with the objective of building indigenous capacity to design and develop real world systems, especially in the field of marine science and technology. Several projects are being initiated with the help of national and international collaborative partners with active participation from both undergraduate and graduate students. The lab aims to play a key role in enabling research culture in the department while producing quality work. The areas of expertise and ongoing projects showcase the lab's commitment to cutting-edge research and development.

Area of Expertise

1. Magneto Inductive/Resonance Communication Systems
2. Underwater Wireless Sensor Networks
3. Design and Development of Indigenous Embedded System Solutions
4. RISC-V architecture

Current Projects

Design of Full Duplex Underwater MI sensor Node Magneto-Inductive (MI) comm-unication has emerged as a real alternate mode of communication for challenging and complex environment

such as indoor, underground and underwater. MI communication offers a lot of advantages and therefore attracts various applications but the use of lower frequencies to generate quasi static magnetic field, limits the data rate. With growing demand for using MI technology in underwater applications, there is also a demand for higher data-rates. Achieving higher data rate is highly required. To increase the data rate of MI based system we are working on a full duplex communication system that doubles the existing data rate and significantly improve and enhance the capabilities. This project will enable real-time monitoring of underwater environments.

Design of 32-bit RISC-V Processor using Synthesizable SystemC and High-level Synthesis

The worldwide market for semi-conductor Intellectual Property (IP) blocks is expected to approach 8 billion by 2019. A growing variety of these IP blocks populates any System-on-Chip (SoC) for embedded systems or Internet-of-Things (IoT) and therefore SoC architects seek the right mix of components for the target application domain, while being pressured by stringent time- to-market constraints. To cope with design complexity, it is necessary to raise the level of abstraction by embracing system-level design methods. These include the use of high-level programming languages, like C/C++ and SystemC, for design specification and the application of High-Level Synthesis (HLS) for design optimization. This project thus works on the design and implementation of a 32-bit RISC-V processor core with HLS to contribute in the development of more efficient and powerful processors for use in a variety of applications

Low Power Scalable Multi-Core Embedded System

Multi-core processor-based system requirements emerge with an increase in demand of computational power. But these multi-core processors are typically accompanied with highpower consumption. In this project, a micro-operating system is being developed for execution of a multithreaded embedded program with shared memory on multicore system. The user program is divided into multiple threads with their own stacks and capability to context switch for improved throughput.

Collaborators and Partners:

The current projects at MARS lab are in collaboration with both national and international academic as well as research organizations.

1. Harbin Engineering University (China)
2. Bremen University (Germany)
3. National R&D organization (NESCOM)

Research Group Members:

1. Dr. Niaz Ahmed
2. Mr. Ehsan Rehman
3. Mr. Umair Fiaz
4. Mr. Ibad Rahman
5. Mr. Adil Mubashar
6. Mr. Naqi Raza
7. Mr. Usama Sadiq
8. Ms. Kalsoom Tariq

7. Artificial Intelligence Diagnostics (AID) LAB

Introduction

AID lab was established in 2022 mainly focused on Medical Image Processing specifically in Brain Tumor Segmentation through brain MRI. Other areas of concentration within the domain are outcomes prediction, tumor grade detection, medical report writing, and diagnosis of other diseases through medical images such as kidney tumor, pneumonia and pneumothorax detection through chest X-rays, and skin lesion detection. As the name suggests AI is being extensively used for the purpose including generative AI, 2D and 3D deep learning models for classification and segmentation, and mathematical approaches such as Topological Data Analysis (TDA). In the future we intend to incorporate gene sequencing data for diagnosis, prognosis, and treatment planning. We also aim to develop products and commercialize them in the future. We have so far attracted more than PKR 150 million rupees of funding from HEC and otherdonor agencies.

Research Collaborators

1. Aga Khan University, Karachi
2. Pakistan Institute of Medical Sciences (PIMS)
3. Rawalpindi Medical University
4. Shaheed Zulfiqar Ali Bhutto Medical University

8. XYLEXA (Industry Collaborator)

Pioneering research-based AI and Deep Learning solutions for medical imaging, empowering clinicians worldwide to achieve superior clinical outcomes Detection | Prediction | Analytics

Potential Collaborations in Progress:

1. Duke University, USA
2. NADRA, Pakistan
3. NESCOM

PakistanResearch Team

1. Dr. Ahmad Raza Shahid
2. Dr. Umme Zahoora
3. Mr. Ansar Rehman
4. Ms. Salma Asif
5. Ms. Ayesha Satti
6. Mr. Usman Sadiq
7. Ms. Zeba Saleem
8. Mr. Hasan Nasir Khan
9. Ms. Mutyyba Asghar

10. Ms. Anum Fatima

Research Grants

1. **Grand Challenge Fund by HEC:** Secured a 38.64 million rupees sub-award as part of a collaborative funding initiative with Aga Khan University Hospital, which totaled 96.77 million rupees.

2. **Planning commission through HEC:** Won 97.57 million rupees of research funding from HEC under the National Center of Artificial Intelligence (NCAI) project.

3. **NCAI Funding:** Received 13.484 million in support from the NCAI Center for AI-driven healthcare innovations.

4. **Pakistan Science Foundation**: Received the 10 million research grant under the project titled "Development of Artificial Intelligence based CADx system for rapid diagnosis of COVID-19 patients using Chest X-Ray (CXR) and Computed Tomography (CT) scans"

5. **Faculty Research Support Grant:** Secured 1.2 million research fund for the topic "Medical Imaging Diagnosis Diagnosis with Patch-Based 3D Attention U-Net from Multi-parametric MRI"

6. **Faculty Research Support Grant:** Secured 0.9 million research fund for the Brain Tumor Segmentation project

Current Projects

ViBCOT under HEC Grand Challenge Fund GCF-912

The project Virtual Biopsy for Classification, Outcome Predic-tion, and Treatment Planning of Brain tumors (ViBCOT), funded under HEC GCF-912, leverages AI and machine learning to develop an automated system for brain tumor diagnosis, outcome prediction, and personalized treatment planning. This collabo-ration between FAST and AKU University targets enhanced biopsy accuracy during surgeries and aims to elevate patient care standards in public and private healthcare settings.

Brain Tumor Segmentation using Topological Data Analysis and Deep Learning under FRSG

This project utilizes Topological Data Analysis (TDA) techniques to analyze the shape and geometry of brain tumor MRI, enhancing interpretability when integrated with other machine learning algorithms. It also involves the fusion of TDA-based features with deep learning features, creating a comprehensive approach for brain tumor segmentation that combines hand-crafted and deep features, improving the accuracy and efficacy of the segmentation process. The following diagram shows an end-to-end pipeline.

Medical Imaging Diagnosis with Patch-based 3D Attention U-Net from Multi-parametric MRI under FRSG:

This project focuses on creating tumor-centered patches to capture the entirety of the tumor while preserving boundaries, leading to a more balanced distribution of training data and streamlined attention mechanism for efficient and effective medical image analysis. Project end-to-end pipeline w.

9. NCRA – UAV Dependability Lab

UAV Dependability Lab targeting the dependable development of Unmanned Aerial Systems (UAS) is part of the National Center for Robotics and Automation (NCRA) and was established in 2019. The lab is the recipient of a funding of ~PKR 100 Million from the Higher Education Commission under the NCRA project. The lab has successfully secured external industrial and research funding of more than PKR 22 Million in the last 3 years. The lab works closely with industrial and academic partners and plays an important role in the indigenous development of dependable avionics systems and automation solutions. The lab has a specialty of working in the area of autonomous systems, cyber-physical systems, and industrial automation and utilizes state-of-the-art strategies, including data science, machine learning, digital twins, for development of reliable and dependable unmanned vehicles.

The UAV Dependability Lab is working on automated testing of avionics systems for autonomous and semi-autonomous UAVs to ensure the dependable development of such systems. The Lab assists the local industry in developing dependable UAV avionics systems that comply with international standards.

Core Research Areas

The Dependability Lab focuses on the engineering of reliable software systems.

For this purpose, the Lab investigates the use of model-driven approaches for developing high-quality software. Software testing is a time-consuming process that requires specific expertise and automation to be cost- effective, which are often not available in the industry. The Lab aims to bridge this gap by developing novel strategies and tools for quality engineering and automated testing that are scalable in an industrial context. The real impact of software engineering is visible only when the practices/techniques are transferred to the practitioners or industry. Therefore, the lab focuses on performing applied research by solving real industrial problems.

Major Achievements

Some of the key achievements of the lab include:

1. Development of an indigenous

Ground Control Station (GCS) for UAS Systems. The operators can plan and simulate the complete mission on the ground control station before actual execution. The GCS supports heterogeneous UAVs (quadcopters and fixed-wing aircraft) and allows the operation of multiple UAVs simultaneously.

2. Development of a traffic monitoring and control system using the indigenous GCS. The application is aimed at traffic police operations and supports live monitoring and control of traffic and large-scale gatherings.

3. Automated strategies and Software-in-Loop test bed for testing of Cockpit Display Systems. The test bed allows the developers to test the working of various widgets used in PFDs using Artificial Intelligence. The AI algorithms generate test cases and place the aircraft in different scenarios that simulate real-world operations.

4. Capacity building of national organizations in the area of mission and safety critical systems development. Several engineers from national defense sector organizations have been trained as part of lab activities on the development and testing of safety-critical systems as per international standards. This expertise is severely lacking in Pakistan and previously the trainings used to be held at foreign venues.

5. The Lab publishes in top-ranking international journals and international conferences in the areas of model- based development, model-based testing, system and software engineering, and Application of AI and ML in Software Engineering.

Partners and Collaborations

1. Pakistan Air Force

2. National Engineering and Scientific Commission (NESCOM)
3. Software Testing Foundation and PSTB
4. SQA Services Pvt Ltd
5. Quest Pvt Ltd
6. Simula Research Lab, Norway
7. Dr. Frigz International

Research Group Members:

1. Dr. Muhammad Uzair Khan
2. Dr Atif Aftab Ahmed Jilani
3. Dr Syeda Javeria Imtiaz
4. Dr Hassan Sartaj
5. Ms. Nigar Azhar
6. Ms. Maheen Arshad

10. Management Advancement Research Center (MARC)

The MARC team is led by the Director MARC, Dr. Sadia Nadeem, Deputy Directors Dr. Muhammad Abbas, and Dr. Shuja ul Islam. The core team includes Qaiser Shafi, Sarah Khan, and Hamnah Rahat. Other faculty members, researchers, and students join the MARC team on a project-by-project basis. The team is committed to taking on projects which contribute to the body of knowledge, yet at the same time provide a bridge between academia and practice.

Core Research Areas

Dr. Sadia Nadeem: Leadership, gender diversity, Cross Cultural HRM, performance management, and HR systems

Dr. Muhammad Abbas: Islamic work ethics, organizational politics, workplace stressors, and generative artificial intelligence

Dr. Shuja ul Islam: Behavioral decision-making and project management

Major Achievements

The various projects of MARC, including the funded and non-funded work has resulted in the following outcomes:

1. Journal Publications: 19 plus publications in academic journals, including an FT 50 publication, and seventeen impact factor publications.
2. Conference Presentations: 15 plus conference presentations including papers at the Academy of Management (US) conference and the British Academy of Management conference.
3. Industry Reports: Four major industry reports, and several leaflets, summary finding sheets, and confidential company reports.
4. Industry presentations: The Director MARC is routinely invited as a speaker at various professional forms to share her findings and thoughts with industry leaders.
5. Academic Trainings: The core team members of MARC deliver research-related training at academic institutions in Pakistan and abroad.
6. MARC Student Projects: One PhD, and various MS and UG projects have been completed under MARC.
7. Case Studies: One published case study and two unpublished cases produced from MARC projects.

Current Projects

Nation-building through Supporting Females (NSF)

Project Code NRPU 15351

Principal Investigator: Dr. Sadia Nadeem

This projects aims to identify ways to reduce organizational challenges in enhancing gen-der diversity and inclusion in organisations. It also aims to understand the challenges faced by women in attaining leadership positions, and identify ways to overcome these challenges. Multiple studies will use a variety of qualitative and quantitative data collection

techniques for various sub-studies of the project.

A double-edged sword? Examining the causes and consequences of Chat GPT usage among students (CCC). FAST NUCES FRSG Fall 2023.

Principal Investigator: Sarah Khan; Co-PI: Dr. Muhammad Abbas

This projects aims to identify the positive and negative consequences of the use of Chat GPT among students.

Colonial Mindset Discrimination and its Impact on HR Practices

This project extends the work of Bano and Nadeem (2018) by examining a new concept of discrimination and disadvantage in the labor market based on colonial mindset and international experience.

International Collaborations:

GLOBE 2020: Collaboration with Simon Frasier University, Canada, and Thunderbird Business School, Arizona State University, US, in an international project to understand and compare the Pakistani culture and leadership behaviors with 140 countries across the world.

Projects Completed with Brief Details

Pakistanis in Chinese Organi-sations (PiCO): Project Code NRPU-10188. The project developed an understanding of the adjustment process of senior Chinese expatriates in Pakistan and the eventual impact of their adjustment on social identity change experiences of Pakistanis who work under their direct supervision.

The Management Advancement and Planning Study (MAPS): Project Code NRPU 3457. The project provided a comprehensive account of the state of HR practices and working life inside Pakistani workplaces using data collected from 404 organizations and 3,472 employees.

Impact of Business Education on Students' Values: Project Code NRPU 4812): The project developed an in-depth understanding of how business educations impacts the values of students, using data collected from students over a period of three years to understand the change in values over time.

Management in Pakistani Culture (MiPC): Project Code TRGP-III/954. The project examined the impact of national culture and values on management of human resources and high performance work systems to identify practices which can improve organizational effectiveness in Pakistan.

The MARC Gender DEI Toolkit Series (Volume I and II) and the forthcoming Volume III, have been well received by the industry.

Reports written for the industry audience include:

Nadeem, S. Fayyaz, I, Ahmad, M, Misbah, N., and Sohail, S. (2023). Gender DEI Toolkit: A guide to resolve implementation challenges (Volume II). Islamabad: MARC, FAST NUCES.

Nadeem, S., Siddiqa, A., Jamil, J., Khan, N., Fawad, R., and Bano. A. (2022). Gender DEI Toolkit: Best practices to enhance gender equality in Pakistan (Volume I). Islamabad: MARC, FAST NUCES.

Nadeem, S. and Mumtaz, S. (2020). PICO 2020: Examining the Relationship between Pakistanis and Chinese Working in Chinese Organizations in Pakistan. Islamabad: MARC, FAST NUCES.

Nadeem, S. and Rahat, H. (2018). MAPS 2017: A Study of HR Practices in Pakistan.

Nadeem, S. (2016). Management in Pakistani Culture. , Islamabad: MARC, FAST NUCES.

For more information visit the website link: http://isb.nu.edu.pk/Research/Details/20

11 Knowledge Discovery and Data Science Lab

The Knowledge Discovery and Data

Science Lab (KDD) is a research facility that is dedicated to leveraging the power of Artificial Intelligence and Data Science to solve real-world problems. The lab's research has a significant impact on society, with practical solutions developed in various applied areas. The lab

Core Research Areas/ Research Foster (Place Diagram or in Bullet form)

The Lab specializes in the areas of

• Data Science	• Artificial Intelligence
• Data Visualization	• Machine Learning
• Visual Analytics	• Health Informatics
• Big Data Analytics	• Smart Agriculture
• Social Networks Analysis	

is a hub of innovation, fostering a culture of scientific exploration and technological advancement.

Some Key Project Highlights

1. Redesign the process of E-recruitment which will be based on AI and enhanced analysis of temporal data. The product will be an AI-powered recommender system that will help local and international organizations enhance their human resource management process and shortlist candidates.

2. Non-Invasive Estimation of body vitals through Smart Phone's sensors and cameras.

3. Incorporating modern technology and methods to redefine the capabilities of law enforcement agencies and help ensure public safety.

4. To provide a foolproof road safety system using existing resources optimally
5. Leveraging News Reuse Analysis and Visualization for Informed Decision-Making

Research Group Members:
1. Dr. M. Faisal Cheema
2. Dr. Ahmad Din
3. Dr. Usman Habib
4. Ms. Khadija Mehmood
5. Mr. Saad Salman
6. Ms. Hira Masroor
7. Ms. Daniya Jadoon
8. Ms. Sana Razzaq
9. Ms. Kanwal Naz

Research Grants

Completed

1. Title: Re-Designing E-recruitment using AI for Temporal Analysis

Source of Funding: National Center for Artificial Intelligence (NCAI), Pakistan

Duration: Mar 2021-present

Funding Amount: 14 Million Rupees

2. Title: Cyber Threat Intelligence using Open Source Intelligence

Source of Funding: National Center for Cyber Security (NCCS), Pakistan

Duration: Mar 2021 – Sep 2022

Funding Amount: 13 Million Rupees

3. Title: Smart Navigation with Intelligence for Visually Impaired People

Source of Funding: Islamic University of Madina, Kingdom of Saudi Arabia.

Duration: Mar 2019 – Sep 2020

Funding Amount: 8.06 Million Rupees

Current Projects

1. Title: e-Doctor: Remote Health monitoring of Patients

Source of Funding: NUCES.

Duration: Apr 2024 - present

Funding Amount: 1.5 Million Rupees

2. Title: Natural Language Text Generation

Source of Funding: NESCOM

Duration: Apr 2024 -present

Funding Amount: 0.1 Million Rupees

Potential Collaborations and Grants:

1. Collaboration with Road Safety Project (HEC-GCF)
2. Collaboration with University of Southern Denmark, Denmark for Leveraging News Reuse Analysis and Visualization
3. Collaboration with CDA Islamabad to provide solutions to turn Islamabad into a smarter city.
4. Initial Collaboration efforts with NADRA to get meaningful insights from their existing data warehouse solutions.
5. Initial Collaboration efforts with Safe City Islamabad to enhance capabilities of law enforcement agencies.

12. CRAFT (Centre for Research in Accounting Finance and Technology)

The Centre for Research in Accounting Finance and Technology (CRAFT) was established in 2022 and is dedicated to the advancement of quantitative finance, accounting, Financial Technology (Fintech) through the creation and spreading of innovative knowledge. The CRAFT aims to enhance understanding of accounting, finance, financial markets, and Fintech through the application of advance econometrics and statistical techniques and methods in micro fields of finance like accounting systems, asset management, security pricing, analysis of stocks, and Fintech.

CRAFT serves as a platform for those researchers who are keen in empirical examination of significant Accounting, Finance and financial technology related issues. The key purpose of this research centre is to encourage the collaborative discussions among academicians, policy makers and industry professionals to generate concrete solutions of business problems. This research centre also bridges the industry-academia gap especially in emerging economies.

Current Project:

NRPU-HEC Funded Project entitled, "Title: Microcredit and Poverty Alleviation: An impact analysis of Prime Minister's Kamyab Jawan – Youth Entrepreneurship Scheme (YES)"

Research Group Members:
1. Dr Muhammad Bilal Saeed
2. Dr Adnan Shoaib
3. Dr Muhammad Yasir