

# Karachi Campus



## Director

### Dr Atif Tahir

Professor  
HEC approved PhD Supervisor  
PhD (CS), Queens Univ of Belfast, UK (2005)  
MS (CE), King Fahd Univ, KSA (2001)  
BE (CS), NED UET, Karachi (1997)

The Karachi Campus provides state-of-the-art facilities at two campuses. The Campus offers expertise of dynamic and staunch faculty members, a secure and healthy environment, and a variety of extracurricular opportunities for students to embrace their existing potentials. Adequate emphasis has been placed upon espousal of student well-being, which includes provision of quality education and availability of various extracurricular prospects. Multiple inter campus committees, student clubs and societies have been established to encourage the intellectual and social development of students, cumulatively.

The campus, while emboldening the entrepreneurial aspirations existing within the students, maintains facilities of Incubation and Innovation Centre as well. Students are provided with adherent mentoring and support. The esteemed faculty members help the students nurture their novel research and developmental ideas, substantially. The Main Campus is located on a six-acre site in Shah Latif Town on the National Highway, ten kilometres east of Karachi airport. The Campus has spacious; fully air conditioned classrooms, laboratories, auditorium, seminar rooms, sports room and a modern library. All Engineering Labs for Power Systems, Electronics, Electrical, Control Engineering, Signal Processing, Telecommunications, Networking, and Multimedia are fully equipped. Computing labs feature the latest technology computers and

workstations that use Linux and Windows-based environments. The Campus upholds a potential network infrastructure and provides seamless connectivity throughout. The Campus maintains a vibrant Research and Development culture. Faculty members are part of multiple research groups. Research seminars, local IEEE, ACM and IET chapters' meetings and seminars are held on a regular basis.

Enhancing the capacity building, the Campus has formed a Centre for Professional Training where periodically different training and seminars are arranged to embrace, improve and retain existing knowledge and skills of the employees and students, respectively. A separate student facilitation centre with a distinctive library, commodious cafeteria, an extensive auditorium, and indoor sports facilities exists within the Campus. The campus also includes Gym with latest equipment, playgrounds for Cricket, Hockey, Football, Basketball, Badminton, Volleyball and Tennis courts. An in house Mosque is also available for the students and employees. The Campus extends efficient and comfortable transport services for students and staff to commute easily from varied locations across the city. An independent Placement and Student Affairs Office exists at Karachi Campus for facilitating the students in job placements and internships. The office arranges various recruitment related events both on campus and externally. The department provides career and skill

development counselling to students, which helps them in effective resume writing, job hunting and personality building. This office even participates in resolving general student concerns and arranging various on campus, student engagement events. The Campus maintains a unique Language Lab to teach students English and other foreign languages while preparing them via video cameras, and round table discussions, for both National and International employability.

The City Campus is situated on the main Shahrah-e-Faisal (near Nursery) houses School for Postgraduate Studies. The City Campus retains air-conditioned contemporary classrooms, high tech computer labs, an out spreaded Seminar Hall and an astounding library, integrated with the Main Campus Library. All the facilities and services extended at the Main Campus are equivalently accessible for the students of City Campus as well.

In addition to the University sponsored financial assistance and scholarships, Karachi Campus also receives scholarships for position holders from the Boards of Sindh and Balochistan, Sindh Endowment Board Scholarship (40% urban and 60% rural quota, every year up to 40 scholarships), Balochistan Endowment Board, Memon Welfare Association, HEC-JICA etc. These funding, aid the students from challenged social backgrounds to pursue quality education smoothly, throughout their academic tenure.

FAST-NUCES Karachi Campus while extending eminence provides quality education, a conducive learning environment and a creative learning experience to its students throughout their academic tenure.

### Programs offered at Karachi Main Campus:

- BS (Artificial Intelligence)
- BS (Business Analytics)
- BS (Computer Science)
- BS (Cyber Security)
- BS (Electrical Engineering)
- BS (Financial Technologies)
- BS (Software Engineering)

### Programs offered at Karachi City Campus:

- MS (Business Analytics)
- MS (Computer Networks and Security)
- MS (Computer Science)
- MS (Data Science)
- MS (Electrical Engineering)
- MS (Software Project Management )
- PhD (Computer Science)
- PhD (Electrical Engineering)



New Multipurpose Block



Gym-1



Cafeteria



Sports room



One-Stop

## Centre for Research in Data Science

Data Science is a dynamic and fast-growing field at the interface of Statistics and Computer Science. It is an interdisciplinary field to get knowledge and various insights from data. The Data Science Research Group at Karachi Campus of National University of Computer and Emerging Sciences addresses the challenges associated with getting information from homogeneous and heterogeneous data. Research group mainly focuses on machine learning and information processing techniques for data analysis with main applications in writer identification, face recognition, cancer classification, multi-label classification, social media data analysis and information visualization. Data Science is going to become an important discipline in Computer Science. The research group will focus on Research Associates and Research Assistants innovative development in this field.

### Main Objectives:

- Conducting Research in areas of Data Science, Machine Learning, Computer Vision, Cloud Computing and Internet of Things/ Wireless Sensor Networks
- Development of Efficient and Holistic Surveillance Systems
- Suspicious Activity and Evidence Detection using Smart IoT Systems
- Academic and Industrial Collaboration to share knowledge and help national security interests

### Partners and Collaboration:

- The University of West of England (UWE), Bristol, UK
- Northumbria University, Newcastle upon Tyne, UK
- NED University of Engineering and Technology, Karachi, Pakistan
- Forschungszentrum Jülich GmbH (FZJ), Germany
- Sarim Burney Trust, Karachi, Pakistan
- Pakistan Rangers
- ByteCorp Private Limited, Karachi, Pakistan
- Qatar University, Doha



### Research Group Members:

- Dr. Atif Tahir
- Dr. Muhammad Rafi
- Dr. Muhammad Nouman Durrani
- Dr. Rauf Ahmed Shams Malick
- Dr. Farrukh Hassan Syed
- Dr. Nadeem Kafi
- Dr. Muhammad Farrukh Shahid
- Mr. Osaid Kaiser
- Mr. Ammar Khawar
- Mr. Omer Qureshi

## The Smart Video Surveillance Lab <https://vslkarachi.com/>

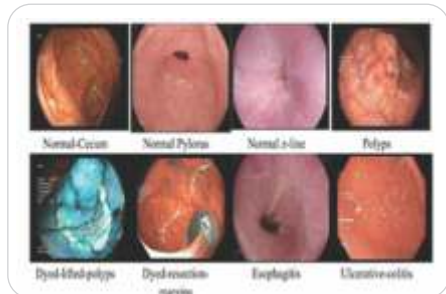
FAST-NUCES, Karachi Campus has been awarded Rs. 39.3 million from the Planning Commission of Pakistan and HEC to establish a state-of-the-art Smart Video Surveillance Lab as a part of the National Centre for Big Data & Cloud Computing (NCBC), Pakistan. The laboratory aims to extract appropriate and timely information from video streams and build deployable models that can benefit government agencies, hospitals, and educational institutes. In this regard, the lab is currently working on multiple surveillance-based applications, namely but not limited to: (a) Theft Car Surveillance, (b) Real-Time Weapon and Face Recognition, and (c) Suspicious Activity and Evidence Detection using smart IoT systems and Active Learning, to address the needs of providing security to the citizens of Pakistan. Prof. Dr. Muhammad Atif Tahir is heading the lab as Principal Investigator along with Dr. Nouman Durrani working in the capacity of Co-Principal Investigator.



### Key Projects:

**Endoscopic Abnormalities Detection:** The objective of the project is to detect abnormalities in the Gastrointestinal Tract using endoscopy. This project is funded by HEC under NRPU worth 3.6 million. This project also aims to improve the diagnosis of GI tract diseases by exploring state of the art Deep Learning technologies. In addition,

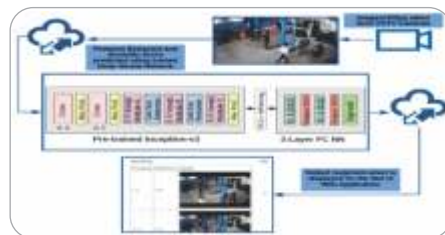
the system should be able to learn with as few images as possible, as in practical situations, a lot of data is not available. In order to do so, advanced machine learning techniques such as class imbalance techniques are currently being investigated.



**Theft Car Surveillance:** Vehicle theft is a serious problem in Pakistan with around twenty-one thousand vehicles being stolen annually in Pakistan worth Rs 5 billion. Smart video surveillance using computer vision and deep learning techniques can be employed to help solve this issue by automatically extracting vehicle features like registration number, model, make and color that can be used in detecting illegal cars. The product can be used by security and law enforcement agencies since stolen vehicles or those used in terrorist and robbery activities normally have a fake license plate attached to them. Through our system, law enforcement agencies can catch criminals involved in such malpractices.



**Real-Time Suspicious Activity Detection from CCTV Videos:** In order to automate the detection of suspicious activity from a stream of CCTV videos, we have employed deep learning techniques such as anomaly detection. Our aim is to develop a prototype application that can indicate any anomalous activity using CCTV videos and then, later on, to integrate it with IoTs for the rendering of alarm in designated security areas. SSP South Police is keen to benefit from this system and has provided video data (50 plus videos) for testing out the developed system. We have developed a prototype that allows the user to upload videos for suspicious activity detection. Deep CNN features are automatically extracted, then an anomaly score is calculated to detect the existence of suspicious activity in the video.



**Missing Children's Surveillance System:** The main objective is to develop a Children's surveillance system for missing children. We are working with Sarim Burney Trust to develop this system. We have developed a system that will provide the facility to upload pictures of the missing child. The system will be able to match faces uploaded by the user of missing children with pictures in the database of the organization. If a picture is matched with any child, the system will generate an alert via email to the relevant user. Our system caters to age invariant face recognition techniques which will be key for the application, and this is the main focus of the research.

#### Key Research Publications:

M Hanif, M Waqas, A Muneer, A Alwadain, MA Tahir, M Rafi, "DeepSDC: Deep Ensemble Learner for the Classification of Social-Media Flooding Events", Sustainability, 15(7), 6049, 2023

M Waqas, M A Tahir, S A Khan, "Robust bag classification approach for multi-instance learning via subspace fuzzy clustering", Expert Systems with Applications 214, 119113, 2023

M Waqas, M A Tahir, R Qureshi, "Deep Gaussian mixture model based instance relevance estimation for multiple instance learning applications", Applied Intelligence, 1-16, 2022

M Shahzad, MA Tahir, MA Khan, R Jiang, RAS Malick, "EBSRMF: Ensemble based similarity-regularized matrix factorization to predict anticancer drug responses" Journal of Intelligent & Fuzzy Systems 43 (3), 3443-3452, 2022

Muhammad Rafi, Rizwan Qureshi, Shah Nawaz, Guiding Attention using Partial-Order Relationships for Image Captioning, CVPR 2022

F H Syed, M A Tahir, M Rafi, M D Shahab, "Feature selection for semi-supervised multi-target regression using genetic algorithm", Applied Intelligence 51, 8961-8984, 2021

M Danish, M A Tahir, M N Durrani, "Hybrid Vision Transformer for Domain Adaptable Person Re-identification" ICCV 2021

#### Systems Research Laboratory (SysLab)

<http://syslab.ai>

SysLab focuses on research and development for building systems which can solve real-world problems through integration of several computing domains. These include Cloud Systems, Distributed systems, Big data, Machine and Deep learning, High Performance Computing (HPC) systems, and Mobile applications. Research at SysLab is inspired by many considerations related to Security, Scalability, Quality of Service, Performance Enhancement, Analytics, accuracy, efficacy, and usability of these systems

Motivated by recent advancements and popularity of Deep Learning, Artificial Intelligence, Cloud Computing, and HPC systems. SysLab also focuses on research and development of these different but related domains. Deep learning solutions can utilize HPC and Cloud Computing for enhanced performance and usability for different mobile and Internet-based applications. Similarly, HPC and deep learning can catalyse solutions for many computational problems and yield increased performance for various applications. Further, technological advancements related to Smart city and Internet of Things, Smart grid, and integration of mobile and cloud, has opened new opportunities for research. The SysLab team is concentrated on the architecture and design of these systems and development of various applications which can benefit from emerging research technologies.

### Research Group Members:

- Dr. Jawwad A. Shamsi, (PI)-HEC Approved PhD. Supervisor
- Dr. Fahad Sherwani-HEC Approved PhD. Supervisor
- Dr. Burhan Khan-HEC Approved PhD. Supervisor
- Dr. Farooque Kumbhar-HEC Approved PhD. Supervisor
- Dr. Nadeem Kafi
- Dr. Nausheen Shoaib

### External Collaborators

- Dr. Narmeen Bawany – Jinnah University for Women
- Dr. Shehnila Zardari - NED University
- Dr. ReazUddin – ICCS
- Dr. Shazia Usmani - FUUAST

### International Collaborators

- Dr. Khaled Salah, Khalifah University of Science and Technology
- Dr. Rizwan Qureshi, UT Texas Houston
- Muhammad Ali Khojaye, UK

### PhD. Students:

- Ms. Anam Qureshi
- Ms. Sonia Salman
- Mr. Adil Sheeraz
- Ms. Zummar Noor

### PhD. Alumni:

- Dr. Nausheen Shoaib
- Dr. Shazia Usmani
- Dr. Narmeen Bawany
- Dr. Nouman Durrani

### Research Staff:

A few full-time research staff members are employed. They are working on developing research and development projects.

### Startup:

Syslab.ai (<http://syslab.ai>) has been set up as a startup to commercialize the projects from syslab. The aim is to develop viable projects, which are appropriate and suitable for masses.

### Industrial Collaborations:

The lab has developed and established industrial collaborations with a few industries as well.

### Current Research Topics:

Smart City and Smart grid, GPU Computing, Blockchain, Distributed Deep Learning, Internet of Things, Software Defined Networks, Natural Language Processing, Heterogeneous Parallel Computing, Cloud Computing, Fog/Edge Computing, Cyber Security for Smart City, Multimedia Wireless Sensor Networks, Security in Smartphones, Precision Medicine, Bioinformatics, Computer Vision, Deep Learning, Machine Learning in Health Analytics.



### Funded Projects:

In 2022, Syslab, received funding from HEC NRPU to develop a deep learning based computer vision based solution for smart cities. PI: Jawwad A. Shamsi Co-PI: Dr. Burhan Khan

Team at Syslab is also working on iParhai – a research project, which is being funded by the National Center for Artificial Intelligence (NCAI). It aims to develop an Adaptive and Adaptable learning based e-learning platform for school going children. PI: Jawwad A. Shamsi Co-PI: Fahad Sherwani

SysLab has also received research grants from NVIDIA and IEEE TCPP. It is also Pakistan's first and only NVIDIA Research Center. In 2017, SysLab received a HEC NRPU grant to develop efficient infrastructure for large-scale communication of IOT devices in a smart city.

### Recent Projects:



**iParhai:** An e-learning system, which adaptive and adaptable learning for school going children. The system utilizes videos and games and an AI-based engine to provide interactive, adaptive, and adaptable learning. <http://iparhai.com>

### Diamond Cutter



Predicts the cricket ball speed using dimensional computer vision techniques.

**Smart Exam Vigilance:** Using state of the art AI based methods, this application invigilates exam and detects anomalous activities for online exams

**Automatic Grading of Answers:** Using NLP techniques, this application automatically grades short answers from students.

**Anomaly Detection:** Using Computer vision techniques, this application automatically detects anomalies such as snatching, accidents, thefts etc.

**Fuel Stealing Detection:** An application for generator surveillance has been developed. The application analyses camera live feed 24/7, detects any mysterious activity like camera tempering, bulb tempering, fuel tank cap opening etc. Upon establishing that fuel theft is suspected, notifications are sent with live feed to concerned security staff.



**Exam Surveillance Application:** An exam surveillance application was developed for automated cheating detection and identification. This application examines live feed from cameras installed at exam sites and identifies any cheating activity by detecting actions of paper exchange, asking a friend and checking mobile phones.



### Key Research Publications:

**Book.** Jawwad A. Shamsi and Muhammad Ali Khojaye. Big Data Systems. CRC Publishers. Taylor Francis. May 2021. ISBN 9781498752701  
Shazia Usmani and Jawwad A Shamsi. LSTM based stock prediction using weighted and categorized financial news. PLOS 2023.

Sonia Salman, Jawwad A Shamsi, and Rizwan Qureshi. Deepfake Generation and Detection: Issues, Challenges, and Solutions. IEEE IT Professional.  
Sana Alam, Shehnila Zardari, Jawwad A Shamsi. Blockchain-Based Trust and Reputation Management in SIoT. Electronics 11(23), 3871.

Rizwan Qureshi, Syed Abdullah Basit, Jawwad A. Shamsi, Xinqi Fan, Mehmood Nawaz, Hong Yan & Tanvir Alam. Machine learning based personalized drug response prediction for lung cancer patients. Scientific Reports Nature. Nov 2022.

M. Murtaza, Y. Ahmed, F. Sherwani, and M. Usman. AI-based Personalized E-Learning Systems: Issues, Challenges, and Solutions. IEEE Access 2022.

Muhammad Hassam, Jawwad A. Shamsi, Ajmal Khan, Ahmed Al-Harrasi, Reaz Uddin Prediction of inhibitory activities of small

molecules against Pantothenate synthetase from Mycobacterium tuberculosis using Machine Learning models. Computers in Biology and Medicine June 2022.

Sana Alam, Shehnila Zardari, and Jawwad A. Shamsi. Comprehensive three-phase bibliometric assessment on the blockchain (2012–2020). Library hi-tech Journal. 2022.

Anam Qureshi, Murk Marvi, Jawwad Shamsi, Adnan Aijaz. EUF: A framework for detecting over-the-air malicious updates in autonomous vehicles. Journal of King Saud University-Computer and Information Sciences 2021.

News sensitive stock market prediction: literature review and suggestions  
Shazia Usmani, Jawwad Shamsi  
PeerJ Computer Science 7, e490 2021.

Capbug-a framework for automatic bug categorization and prioritization using nlp and machine learning algorithms.

Hafiza Ahmed, Narmeen Bawany, Jawwad Shamsi IEEE Access 50496-50512 2021.

Health Quest: A generalized clinical decision support system with multi-label classification.  
Shahzeb Khan, Jawwad Shamsi  
Journal of King Saud University-Computer and Information Sciences 33(1), 45-53.

### Distributed Applications Group (DAG)

The group focuses on multidisciplinary research ranging from distributed systems, its applications in crowd sourcing, implementations of distributed applications that supports handicapped community, building up distributed AI applications in healthcare, developing distributed intelligent human-aware applications that possesses context awareness, Internet of Things based application

development, developing Block chain based interoperable heterogeneous IOT applications etc. The group is also working in developing distributed learning theories and frameworks following the Software Quality Assurance standards to enhance the distributed virtual learning environments. Group's research is fundamental, aimed at harnessing the true potential of distributed crowdsourcing to enhance various phases of software development ranging from requirements engineering until managing bug repositories. The group is application-driven, motivated by important application areas, such as developing distributed applications to utilize the unmanned aerial vehicle (UAV) systems in education & health, developing auditable distributed systems utilizing the state-of-the-art technologies, designing framework for dynamic collaborative swarms etc.



### Research Group Members:

- Dr. Zulfiqar A. Memon (Principal Investigator and Team Lead) - HEC Approved PhD. Supervisor
- Dr. Fahad Samad
- Dr. Abdul Aziz
- Mr. Abdul Rahman

### Research Areas:

- IOT applications
- Blockchain based interoperable heterogeneous IOT applications
- Crowd sourced based distributed applications
- Human-aware computing
- Assistive software development
- Distributed AI applications for healthcare and education
- Distributed Learning Computing
- Distributed Requirement Engineering
- Distributed Dynamic collaborative swarm computing
- Ambient Assisted Computing

### Key Research Publications:

Shanmugasundaram Marappan, Muhammad Danish Mujib, Adnan Ahmed Siddiqui, Abdul Aziz, Samiullah Khan, Mahesh Singh, Lightweight Deep Learning Classification Model for Identifying Low-Resolution CT Images of Lung Cancer, Computational Intelligence and Neuroscience, vol 2022, 2022, pp. 1-10.

Malick, R.A.S.; Hasan, S.K.; Samad, F.; Khan, N.K.; Syed, H.J. Smart Methods to Deal with COVID-19 at University-Level Institutions Using Social Network Analysis Techniques. Sustainability 2023, 15, 5326.

Muhammad Osaid, Zulfiqar Ali Memon, A Survey On Image Captioning, 2022 International Conference on Emerging Trends in Smart Technologies (ICETST), 2022, pp. 1-6.

Maheen Unzeelah, Zulfiqar Ali Memon, Fighting Against Fake News by Connecting Machine Learning Approaches with Web3, 2022 International Conference on Emerging Trends in Smart Technologies (ICETST), 2022, pp. 1-6.

Ahsaan Ansari, Zulfiqar A Memon, The Datacenter Management System using IoT Sensors, 2022 International

Conference on Emerging Trends in Smart Technologies (ICETST), 2022. pp 1-6.

### Funded Project:

In 2023, DAG received funding from the National University of Computer and Emerging Sciences (NUCES-FAST), Islamabad to develop a system titled: "Reconnaissance using swarm Intelligence equipped collective moveable CCTV cameras" PI: Dr. Zulfiqar Ali Memon

### FinTi (Financial Time Series Analysis and Reporting)

FinTi is a newly created research group under the supervision of Dr. Muhammad Rafi, Associate Professor (Computer Science), and Dr. Syed Muhammad Fahad Riaz, Assistant Professor (Department of Social Science and Humanities) along with a bunch of PhD, MS and BS Students. The group currently engaged with Transaction Processing Systems (TPS) {[www.tpsworldwide.com](http://www.tpsworldwide.com)}

There are several projects related to ATM replenishment amount forecasting to sequence of withdrawal forecasting have been initiated. The group actively pursuing state of the art for these problems for local and global businesses

### Key Research Publications:

- Dr. Muhammad Rafi (Associate Professor- Computer Science)
- Dr. Syed Muhammad Fahad Riaz (Department of Social Science and Humanities)

### Research Areas

- Forecasting of Time Series and Panel Data
- Targeting new innovative application in FinTech domain

### Key Research Publications:

1. Rafi, Muhammad et al. 'Towards Optimal ATM Cash Replenishment Using Time Series Analysis'. 1 Jan. 2021 : 5915 – 5927.

2. M. Asad, M. Shahzaib, Y. Abbasi and

M. Rafi, "A Long-Short-Term-Memory Based Model for Predicting ATM Replenishment Amount," 2020 21st International Arab Conference on Information Technology (ACIT), 2020, pp.1-6.

3. M. Rafi, M. T. Wahab, M. Bilal Khan and H. Raza, "ATM Cash Prediction Using Time Series Approach," 2020 3rd International Conference on Computing, Mathematics and Engineering Technologies (iCoMET), 2020, pp.1-6.

### Smart Intelligence Lab (SIL)

<http://researchlab.arche-tech.com/>

The Smart Intelligence Research Group has goals to contribute to the state of the art through research, development, and innovation in the scope of information and communication technologies for Internet of Things (IoT) and Next Generation Networks and Applications. The topics are extremely relevant in telecommunications, digital health and intelligent solutions for live stocks. It intends to perform innovative research aiming to explore an increasing available amount of data in a growing connected world. It focuses on developing new technologies, solutions, and approaches exploring data from their generation and knowledge creation, including their storage, treatment, and analysis. Machine learning and data driven solutions with the nexus of IoT devices is going to bring a new wave of innovation in multiple sectors including health care, industrial automation, urban planning and smart cities.

### Team Members:

- Dr. Ghufran Ahmed
- Dr. Rauf Ahmed Shams Malick
- Dr. Nadeem Kafi Khan
- Dr. Aqsa Aslam

### Funded Projects:

SIL has received a research grant of 10.5 million PKR received under the HEC National Research Programme for Universities (NRPU) in the year 2023. The duration of the project is 2 years. The title of the project is "Monitoring and Prediction of Cows' Health in Dairy Farms".

SIL has already completed a one year research grant of 0.54 million PKR received under the Faculty Research Support Program (FRSG), FAST-NUCES in the year 2021. The title of the project was "Monitoring and Prediction of Chicks' Health in Poultry Farms".

### Research Areas:

- Wireless Body Area Networks (WBANs)
- Wireless Sensor Networks (WSN)
- Industry 4.0
- Bioinformatics
- Social and Complex Network Analysis
- Humanizing AI and Ethical Issues in AI
- Crowdsourced Human Intensive Computing
- Vehicular ad hoc networks

### Recent Publications 2021-23

1. Niazi, Tahira, et al. "Investigating Novice Developers' Code Commenting Trends Using Machine Learning Techniques." *Algorithms* 16.1 (2023): 53.
2. Beenish, Hira, et al. "A Novel Markov Model-Based Traffic Density Estimation Technique for Intelligent Transportation System." *Sensors* 23.2 (2023): 768.
3. Roy, Moumita, et al. "Intra WBAN routing using Zipf's law and intelligent transmission power switching approach (ZITA)." *Journal of Ambient Intelligence and Humanized Computing* 13.9 (2022): 4135-4149. [IF: 3.662]
4. Ashraf, Noorulain, et al. "Criminal Behavior Identification Using Social Media Forensics." *Electronics* 11.19 (2022): 3162. [IF: 2.690]
5. Erum, Iqra, et al. "Complex Network Analysis of Mass

Violation, Specifically Mass Killing." *Entropy* 24.8 (2022): 1017. [IF: 2.738]

6. Ahmed, Ghufran, et al. "An approach towards IoT-based predictive service for early detection of diseases in poultry chickens." *Sustainability* 13.23 (2021): 13396. [IF: 3.889]
7. Ahmed, Ghufran, et al. . An efficient routing protocol for internet of medical things focusing on hotspot node problems. *International Journal of Distributed Sensor Networks*. February 2021.
8. Ahmed G, Mehmood D, Shahzad K, Malick RAS. An efficient routing protocol for internet of medical things focusing hot spot node problem. *International Journal of Distributed Sensor Networks*. February 2021.
9. Saira Beg, Adeel Anjum, Mansoor Ahmad, Shahid Hussain, Ghufran Ahmad, Suleman Khan, Kim-Kwang Raymond Choo, A privacy-preserving protocol for continuous and dynamic data collection in IoT enabled mobile app recommendation system (MARS), *Journal of Network and Computer Applications*, Volume 174, 2021, 102874, ISSN 1084-8045.
10. M. A. Sarwar et al., "Exploiting Ontology Recommendation Using Text Categorization Approach," in *IEEE Access*, vol. 9, pp. 27304-27322, 2021.

### IntelliNet: Intelligent Network Research Center



IntelliNet is a group of people working towards a smarter future with their intellectual endeavors under the supervision and collaboration of



Dr. Farooque Hassan Kumbhar. We believe that the future is smart devices and networks, which facilitate us and create numerous research opportunities. Here in IntelliNet, we develop intelligent systems for Next Generation Networks like Internet of Things, Name Data Networks, 5G Networks, etc.

The IntelliNet successfully completed an HEC funded project Smart Electricity Cloud for Efficient Utilization of Distributed Renewable Sources using IoTs", 1 year, 0.5 million PKR.

### Research Group Members

- Dr. Farooque Hassan Kumbhar
- Mr. Ahmer Zeeshan Bukhari
- Ms. Rabia Ahmed
- Mr. Abdullah
- Mr. Abdul Saboor Sheikh
- Mr. Salman Mehmood
- Mr. Syed Shayan Hassan

### Key Research Publications:

**F. H. Kumbhar**, S. Y. Shin, "Innovating Multi-Objective Optimal Message Routing for Unified High Mobility Networks," IEEE Transactions on Vehicular Technology, vol. 00, no. 00, pp 1-12, 2023 [IF: 6.239]

I. Azam, **F. H. Kumbhar**, S. Y. Shin. "BVP: Balanced Vehicular Pairing for Fair Resource Distribution in Downlink NOMA", IEEE Transactions on Intelligent Transportation Systems, vol. 23, no. 11, pp 22008-22014, 2022 [IF: 9.51]

**F. H. Kumbhar** and S. Y. Shin, "Novel Vehicular Compatibility-Based Ad Hoc Message Routing Scheme in the Internet of Vehicles Using Machine Learning," IEEE Internet of Things Journal, vol. 9, no. 4, pp. 2817-2828, 15 Feb.15, 2022.

R. Ahmed, **F. H. Kumbhar**, "VC3: A Novel Vehicular Compatibility-Based Cooperative Communications in 5G Networks" IEEE Wireless Comm. Letters, vol. 10, no. 6, pp. 1207-1211, 2021. [IF: 4.66]

N. Saxena, **F. H. Kumbhar** and Abhishek Roy, "Exploiting Social Relationship for Trustworthy D2D Relay in 5G Cellular Networks", IEEE Communications Magazine, vol. 58, no.2, Feb,2020.

### FAST School of Management Research Group:

The FAST School of Management commits itself to engage in research which supports its mission. This means facilitation and provision of support for curriculum design, writing of research papers, and establishment of Centers for Research that are aimed at discovering scholarship, which is rationally rigorous, socially integrative, morally intensive, relevant, and internationally acknowledged. In addition, this research strongly associates with solving global, national, and local issues of significance from within the School's preferred paradigm of knowledge.

### Research Group Members:

- Dr. Nazia Nazeer
- Dr. Muhammad Saad

### Research Areas:

- Economics
- Banking & Finance
- International Human Resource Management
- Finance & Business Management

### Key Research Publications:

Xuezhou, W., Hussain, R. Y., Hussain, H., Saad, M., & Qalati, S. A. (2022). Analyzing the impact of board vigilance on financial distress through the intervention of leverage structure and interaction of asset tangibility in the non-financial sector of Pakistan. International Journal of Financial Engineering, 9(02), 2150004.

Mehmood, A., Mirza, A., Saad, M., & Ali, A. (2022). The Influence of Liquidity and Leverage on Profitability: An Evidence from Textile Industry of

Pakistan. Pakistan Journal of Humanities and Social Sciences, 10(4), 1415-1423.

Saad, M., Taib, H. M., Bhuiyan, A. B., & Bhutta, R. (2022). The sustainability of microfinance institutions in Pakistan: empirical issues and challenges. International Journal of Trade and Global Markets, 16(1-3), 144-162.

The Double Bottom Line Commitment and Microfinance Sustainability in Pakistan.

Book Title: Islamic Perspective for Sustainable Financial System (2021)  
Publisher: Istanbul University Press

Hussain, R. Y., Xuezhou, W., Hussain, H., Saad, M., & Qalati, S. A. (2021). Corporate board vigilance and insolvency risk: a mediated moderation model of debt maturity and fixed collaterals. International Journal of Management and Economics, 57(1), 14-33.

Abbas, J., Mirza, H. H., Hussain, H., Hussain, R. Y., Saad, M., & Akhtar, M. (2021). Stock Market Reaction towards Terrorism: An Evidence Based on Seasonal Variation in Pakistan. Journal of Economic Impact, 3(3), 167-177.

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## Center for AI and Complex Systems

**Founder: Dr. Rauf Ahmed Shams Malick**

The world is at the verge of a new era, the humans are entering in a new world of cybernetics that evolved from the nexus of cyber, physical and digital world. The new role of digital and cyber world is transforming humans to perceive, interpret, believe and respond the digital content in a new way. The digital user tends to establish links and communities over social platforms with known and unknown actors that could be humans or bots. With the emergence of virtual world in coordination of social and cyber sphere new links and communities are expected with a rapid pace. In cyber and digital world, the humans tend to believe the content they receive and do share/influence in their respective contagions. The complex systems groups will work on the emerging problems in the area of social sciences, mathematics, biology and economics that are not limited to a few mentioned here:

The obscure global identity of bots/humans across the different world.

Characterizing the fake/propaganda and its spread to manipulate human minds is pervasive in every discipline of our life.

Psychological transformation and rise of digital/gadget addiction by the kind of cyber space users. Development of mental diseases and extreme reactions exhibition particularly by the youth across the globe. This demands highly interdisciplinary collaborations to get the benefit from the wisdom across the domains.

The rise of digital extremism including ethnic, religious, political

and self-beliefs. To uncover, the underlying reasons, upcoming challenges and respective policies. Integrated solution for networked world through state of the art computational tools.

Development of mathematical-computational frameworks to study multi-scale modeling problems in biology and social sciences.

## Projects:

### Classification of Fake News and Modeling of Propaganda over Social Media

The rise of fake news and its rapid spread turned several strategic policies and global wellbeing into horrible situations. Recently, the surge of fake news and propaganda over social platforms has challenged the human ability to curate, trust and absorb the news Content. The avalanche of fake content is leading the humans towards a state of global uncertainty, such state of unbelieve will result into a massive distrust and will shatter the peace at national to international scale. We are working over state-of-the-art technologies to deal with real time issues in the said area.

### Digital Polarization and Democratic Web

Digital Polarization and Democratic Web The widespread usage of social media comes with many benefits, but also significant concerns. Behind the protective barrier of a screen – people freely express views which may otherwise be considered extreme.

## Members:

- Dr. Nadeem Kafi
- Dr. Khubaib Qureshi (IoBM)
- Dr. Ghufan Ahmed

## Collaborations:

1. Professor Dr. Hocine Cherifi, Professor at University of Burgundy, France.
2. Professor Dr. Dong Xufen, Beijing University of Technology College of Economics and Management
3. Professor Laura Frago, Department of Psychology, Evotos Lorán University, Hungary

## Publication:

1. Qureshi, Khubaib Ahmed, Rauf Ahmed Shams Malick, Muhammad Sabih, and Hocine Cherifi. "Deception detection on social media: A source-based perspective." Knowledge-Based Systems (2022).
2. Erum, Iqra, Rauf Ahmed Shams Malick, Ghufuran Ahmed, and Hocine Cherifi. "Complex Network Analysis of Mass Violation, Specifically Mass Killing." Entropy 24, no. 8 (2022): 1017.
3. Zahid, Sumaiyah, Rauf Ahmed Shams Malick, and Muhammad Rabeet Sagri. "Network Dynamics of COVID-19 Fake and True News Diffusion Networks." Journal of Information & Knowledge Management 21, no. Supp01 (2022): 2240009.
4. Shahzad, Muhammad, M. Atif Tahir, M. Atta Khan, Richard Jiang, and Rauf Ahmed Shams Malick. "EBSRMF: Ensemble based similarity-regularized matrix factorization to predict anticancer drug responses." Journal of Intelligent & Fuzzy Systems Preprint (2022): 1-10
5. Qureshi, Khubaib Ahmed, Rauf Ahmed Shams Malick, Muhammad Sabih, and Hocine Cherifi. "Complex Network and Source Inspired COVID-19 Fake News Classification on Twitter." IEEE Access 9 (2021): 139636-139656.

6. Ahmed, Ghufuran, Rauf Ahmed Shams Malick, Adnan Akhuzada, Sumaiyah Zahid, Muhammad Rabeet Sagri, and Abdullah Gani. "An Approach towards IoT-Based Predictive Service for Early Detection of Diseases in Poultry Chickens." Sustainability 13, no. 23 (2021): 13396.
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8. Munir, Siraj, Rauf Ahmed Shams Malick, Syed Imran Jami, Ghufuran Ahmed, Suleman Khan, and Joel JPC Rodrigues. "An integrated approach: using knowledge graph and network analysis for harnessing digital advertisement." Multimedia Tools and Applications (2022): 1-16.
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10. Rauf Ahmed Shams Malick, Syed Kashir Hasan, Fahad Samad, Nadeem Kafi Khan, and Hassan Jamil Syed. "Smart Methods to Deal with COVID-19 at University-Level Institutions Using Social Network Analysis Techniques." Sustainability 15, no. 6 (2023): 5326.

## Science and Humanities Research Group:

### Algebra:

Commutative algebra is a classical area of mathematics that studies algebraic structures over commutative rings. Following the fundamental works of R. Dedekind, D.

Hilbert, E. Noether and W. Krull, among others, it became an independent field in the 1930s. One of the most outstanding starting points was the work of Hilbert on ideals in a polynomial ring and their free resolutions, a topic that has been a permanently active line of research ever since. Research of this group is mainly focused to develop, construct, and implement the bases (resp generating sets) for ideal, subalgebra, and submodules respectively via different ordering and grading. Moreover, the goal of this group is to implement the algorithm for the construction of these bases on SINGULAR (A Computer Algebra System for Polynomial Computation). The current research included applications of bases under the composition of polynomial, and implemented the library for the computation of Sagbi- Gröbner bases which has been added on SINGULAR.

## Research Group Members

- Dr. Nazish Kanwal
- Muhammad Abdul Basit Khan

## Key Research Publications:

Kanwal, N., Khan, J.A. Sagbi-Grbner Bases Under Composition. J Syst Sci Complex (2023).

Nazish Kanwal, Nazia Jabeen & Junaid Alam Khan (2021) Standard bases for modules over polynomial subalgebras, Communications in Algebra, 49:1, 58-72.

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