

Muhammad Ahmed Mohsin

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EDUCATION

- National University of Sciences & Technology (NUST)** Islamabad, Pakistan
Bachelors of Engineering in Electrical Engineering Aug. 2020 – June 2024
- **CGPA** – 3.87/4.0 | **Specialization GPA** – 4.0/4.0 | **Merit Scholarship** 2021-2024
 - **Senior Design Thesis:** Analytical Analysis of STAR-RIS enhanced NOMA-CoMP Networks | [Demo](#) | [Poster](#)
- Punjab College of Science and Technology** Islamabad, Pakistan
Intermediate Educaton, Pre-Engineering Mar. 2018 – April 2020
- **Marks Percentage** – 97.37%
 - **Distinction:** President's Medal for third position pre-engineering group nationwide.

PUBLICATIONS | [GOOGLE SCHOLAR](#)

- Perofrmance Analysis of Aerial RIS Assisted Next-Gen Comp - NOMA Networks** [Paper/Code](#)
IEEE Globecom 2024 – IEEE Communications Society | Submitted
Muhammad Ahmed Mohsin, Muhammad Farhan, Muhammad Saad
- Vision Transformers for Semantic Communications** [Paper/Code](#)
IEEE VTC 2024 – IEEE Communications Society | Submitted
Muhammad Ahmed Mohsin, Muhammad Farhan, Muhammad Saad, Muhammad Jazib
- On the Energy Efficiency and Passive Beamforming Design of RIS Assisted CoMP-NOMA Networks** [Paper/Code](#)
IEEE Globecom 2024 – IEEE Communications Society | Submitted
Muhammad Umer, Muhammad Ahmed Mohsin*, Syed Ali Hassan and Haejoon Jung* [*joint equal contributors (co-first authors)]
- Deep Reinforcement Learning Trajectory and Beamforming Optimization of Aerial RIS in CoMP-NOMA Networks** [Paper/Code](#)
IEEE Globecom 2024 – IEEE Communications Society | Submitted
Muhammad Umer, Muhammad Ahmed Mohsin*, Syed Ali Hassan, and Haejoon Jung* [*joint equal contributors (co-first authors)]
- Multi-Agent Deep Reinforcement Learning for Cooperative and Fuel-Efficient Autonomous Driving** [Paper/Code](#)
IEEE FIT 2024 | Submitted
Muhammad Umer, Muhammad Abdullah Sohail, Muhammad Ahmed Mohsin, Hassan Rizwan
- STAR-RIS Assisted Downlink CoMP-NOMA Multi-Cell Networks under Nakagami-m Fading** [Paper/Code](#)
IEEE Communication Letters 2023 – IEEE Communications Society | Published
Muhammad Umer, Muhammad Ahmed Mohsin*, Syed Ali Hassan, Haejoon Jung, and Mikael Gidlund (Mid Sweden University)* [*joint equal contributors (co-first authors)]
- Performance Analysis of STAR-RIS Enhanced CoMP-NOMA Multi-Cell Networks** [Paper/Code/Poster](#)
IEEE Globcomm 2023 – IEEE Communications Society | Published
Muhammad Umer, Muhammad Ahmed Mohsin*, Syed Ali Hassan, Haejoon Jung, and Haris Pervaiz* [*joint equal contributors (co-first authors)]
- PyramidTabNet: Transformer-Based Table Recognition in Image-Based Documents** [Paper/Code/Poster](#)
ICDAR 2023 – Springer Nature Switzerland AG | Published
Muhammad Umer, Muhammad Ahmed Mohsin, Adnan Ul-Hasan, and Faisal Shafait
- Multiphysics Informed Digital-Twin for Fault Localization in Induction Motor** [Paper/Presentation](#)
IEEE BigData 2023 – Bulgaria, Sofia | Published
Amina Bashir, Muhammad Ahmed Mohsin*, Jazib Qamar*, Hafsa Iqbal* [*joint equal contributors (co-first authors)]
- Zero-Shot Learning via GANs and SAGANs: A Performance Analysis** [Paper/Presentation](#)
20th Int. on Frontiers of Information technology, IEEE FIT 2023 | Published
*Muhammad Ahmed Mohsin, **Advisor:** Omair Shafiq (Carleton University)*

CORPORATE EXPERIENCE

- Adept Tech Solutions** June 2024 – Present
Location San Jose, California (Remote)
Domain: Generative AI
- Currently working on synthetic data generation from no data.
 - Working on LLM Models for the product ASCEND by Adept Tech Solutions for LLM based Business Solutions.
 - Proposed superior efficacy pipeline for synthetic data generation for Gen AI models.

RESEARCH EXPERIENCE

National Chung Cheng University IIP, Taiwan

June 2024 – Present

Advisor: Dr. Jen Yi Pen | Member IEEE

[Google Scholar](#)

Project: Distributed Machine Learning for Channel Estimation in RIS enabled Wireless Networks

TO be submitted in: IEEE Globecom'24 | [Github](#)

- Working on Distributive Machine learning for channel estimation in RIS Networks
- Working on Hierarchical Machine Learning approach for diverse scenario channel estimation for downlink networks
- Working on Active RIS for better efficacy in Atypical Network scenarios.

Information Processing and Transmission Lab, SEECS, NUST

June 2023 – Present

Advisor: Dr. Syed Ali Hassan (Georgia Tech) | Senior Member IEEE

[Google Scholar](#)

Project: Statistical Analysis of STAR-RIS Assisted Downlink CoMP-NOMA Multi-Cell Networks

Submitted in: IEEE CL'23 | [Github](#)

- Performed Statistical Analysis of STAR-RIS enhanced NOMA-CoMP systems.
- We computed tractable ergodic rates using Inferential and stochastic probability analysis of wireless channels.
- The method of moments was generalized, and the central limit theorem was utilized for computing closed-form equations.

Project: Performance Analysis of STAR-RIS Assisted Downlink CoMP-NOMA Networks

Accepted in: IEEE GLOBECOM'23 | [Github](#)

- Performed performance analysis for STAR-RIS Enhanced CoMP-NOMA Multi-Cell Networks, proposed system model.
- Using heuristic computation, we maximized the system's data rate by optimal allocation of STAR-RIS resources.
- We analyzed the difference in data rates of CoMP, Non-CoMP, RIS and Non-RIS systems of our novel system model.

Project: On the Energy Efficiency and Passive Beamforming Design of RIS Assisted CoMP-NOMA Networks

To be presented in: IEEE GLOBECOM'24 | [Github](#)

- Performed performance analysis for STAR-RIS Enhanced CoMP-NOMA Multi-Cell Networks with multiple base stations and RIS.
- Performed exhaustive resource allocation for RIS to maximize the data rate of the users.
- We analyzed the difference in data rates of CoMP, Non-CoMP, RIS and Non-RIS systems of our extended novel system model.

Project: Deep Reinforcement Learning Trajectory and Beamforming Optimization of Aerial RIS in CoMP-NOMA Networks

To be presented in: IEEE GLOBECOM'24 | [Github](#)

- Performed performance analysis for UAV assisted STAR-RIS enhanced NOMA-CoMP Networks.
- Used Deep Reinforcement Learning to maximize the sumrate of the system.
- Optimized the UAV Trajectory, Passive Beam forming at RIS and NOMA Power Allocation Factors.

School of Information Technology, Carleton University, Canada

June 2023 – Sep 2023

Advisor: Dr. Omair Shafiq (Carleton University) | Member IEEE

[Google Scholar](#)

Project: Zero-Shot Learning via GANs and SAGANs: A Performance Analysis

Accepted in: IEEE FIT'23 | [Github](#)

- Proposed Zero-Shot Learning (ZSL) and Self-Attention GANs for ZSL tasks.
- Demonstrated SAGAN's superior performance over GAN in ZSL, through self-attention mechanisms and reduced model collapses.

TUKL Research and Development Lab, SEECS, NUST

June 2022 – Aug 2023

Advisor: Dr. Faisal Shafait (RPTU Kaiserslautern-Landau)

[Google Scholar](#)

Project: Vision Transformers for Table Detection

Published in: ICDAR'23 | [Github](#)

- Implemented a multi-stage pipeline for systematically extracting and interpreting tabular structures in image-based documents.
- Proposed advanced image transformer architecture and novel data augmentation, enhancing results to beat state-of-the-art models

Advisor: Dr. Adnan-ul-Hassan (RPTU Kaiserslautern-Landau)

[Google Scholar](#)

Project: Tabular Augmentation for Table Detection

Presented in: TUKL Annual Meeting | [Github](#)

- Proposed a tabular augmentation pipeline to enhance table detection accuracy.
- Improved the efficiency of the previously proposed tabular augmentation model.

MachVIS Lab, SEECS, NUST

June 2022 – Oct 2022

Advisor: Dr. Muhammad Moazam Fraz (Kingston College)

[Google Scholar](#)

Project: Object Orientation Aware Detection System

- Annotated dataset of 6000 images featuring oriented and conventional bounding boxes.
- Devised a robust architecture and algorithm to discern object orientations accurately, generating corresponding bounding boxes aligned with the detected angles.

PROJECTS

TabAuG 2.0: | [Github Link](#) | **Advised by:** [Dr. Faisal Shafait](#) and [Dr. Adnan-ul Hassan](#)

- Table structure recognition and text extraction using novel augmentation techniques. Enhanced tabular augmentation pipeline to increase efficacy of detection and extraction of information from tables.

MADRL | [Github Link](#) | **Advised by:** [Dr. Hafsa Iqbal](#)

- Multi- Agent Deep Reinforcement Learning algorithm for efficient maneuverability of electric vehicles in dense traffic environments keeping in check the comfort, fuel efficiency and collision protocols.

i-POET | [Github Link](#) | **Advised by:** [Proff. Bostan Khan](#)

- Reinforcement Learning (RL) to optimize power usage in an IoT system by training an RL agent as the Controller to manage IoT Node power states and request queues, aiming to minimize power consumption while maintaining efficient request handling.

Deep-Suppressor: | [Github Link](#) | **Advised by:** [Dr. Ahmad Salman](#)

- Deep Learning-based Pytorch Noise Filtering for Speech Enhancement. Created a Custom U-Net model for noise filtration through spectrograms. Trained on large datasets and worked in real time and offline.

SimComm: | [Github Link](#) | **Advised by:** [Dr. Syed Ali Hassan](#)

- Published a package for mobile network simulation containing the implementation of the framework used to conduct analytical analysis as part of our senior design thesis.

RL-Wireless: | [Github Link](#) | **Advised by:** [Dr. Neelma Naz](#)

- Reinforcement Learning for Resource Allocation in Wireless Networks. We compared accuracy of DRL algorithms on our system model with changing network conditions and user demands.

AeCC: | [Github Link](#) | **Advised by:** [Dr. Ahmad Salman](#)

- Developed a system utilizing a vision transformer-based autoencoder for encoding input images into a lower-dimensional latent space, followed by denoising network reconstruction from the noisy received representation.

OFDMA-NOMA: | [Github Link](#) | **Advised by:** [Dr. Huma Ghafoor](#)

- Optimization for NOMA and OFDMA-assisted wireless networks using heuristic computation. Through iterative analysis we optimized 4 user NOMA pairs vs. OFDMA Network.

HONORS AND ACHIEVEMENTS | [DRIVE](#)

Ph.D. Fellowship: Awarded Stanford Graduate Fellowship.

Position Holder: President's medal for third position pre-engineering group nationwide.

Scholarship Pointers: HSSC Federal Board scholarship recipient worth PKR 2,00,000.

STEP- ECAT scholarship recipient for being top 10 engineering category worth PKR 2,00,000.

PCS Scholarship recipient worth PKR 2,40,000.

NUST Merit Scholarship for top GPAs (2021 – 2024)

Captain Basketball: Captain Basketball team Cadet College HasanAbdal (Juniors – 2017)

Clubs and Societies: *IEEE*, Executive member, (2020)

Youth Entrepreneur Society, member Directorate, (2020)

Community Service: 120 hours of community service completed in Akhuwat Foundation.

Community service at the World Wildlife Fund Cadet College HasanAbdal chapter.

RELEVANT COURSEWORK

Communication Systems: Mobile Communication Systems, Communication Systems, Computer and Communication Networks, Digital Signal Processing, Signals and Systems.

Computer Sciences: Artificial Intelligence, Computer Vision, Machine Learning, Data Structure and Algorithms.

SKILLS

Languages: C/C++, Python, MATLAB, Wolfram Language, \LaTeX

APIs & Libraries: Pandas, Numba, SymPy, SciPy, RLib, PyTorch, TensorFlow, OpenCV

Tools: MATLAB, Git, Bash, Visual Studio, Adobe Suite, Office Suite, Proteus Suite, SPICE Kit