

# Talha Ahmed

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## EDUCATION & RESEARCH BACKGROUND

### Lahore University of Management and Sciences (LUMS)

B.S Mathematics - Economics (Joint Major) + Minor in Computer Science

Sep. 2020 – May 2024

CGPA/Minor GPA: 3.83/3.87

**Relevant Courses:** Real Analysis, Adv. Calculus, Applied Probability, Data Structures, Machine Learning, Convex Optimization, Data Mining, Deep Learning, Adv. Signal Processing, Reinforcement Learning, Adv. Econometrics, Generative AI, Numerical Analysis

**Research Interest Keywords:** Generative AI, Diffusion/Score-Based Models, Computational/Medical Imaging, Inverse Problems, Representation/Unsupervised Learning, Compressed Sensing. See [Presentation Overview](#)

## RESEARCH EXPERIENCE

### Research Assistant

Summer 2024 – Present

Dr. Hassan Mohy-ud-Din – [Algorithms in Theory & Practice Lab @ LUMS](#)

Lahore, Pakistan

- Main research is centered on generative models and their applications in medical imaging and inverse problems like MRI reconstruction, binary/multi-class segmentation and image restoration, resolution etc.
- First author of **Wave-GMS** (ICASSP 2026, under review): lightweight multi-resolution generative model (~2.6M params) achieving state-of-the-art segmentation and cross-domain generalization on medical imaging datasets.
- Compiled notes on mathematical inequalities, e.g. [Jensen's Inequality](#), and their applications in data science and information theory.

### Senior Year Thesis

Summer 2023 – Summer 2024

Dr. Muhammad Tahir

Lahore, Pakistan

- Senior year project on **Model-Based Deep Learning** for matrix completion. Proposed ConvMC-Net, a convolutional network replacing nuclear-norm updates with trainable layers, achieving faster and more accurate recovery compared to ALM and ADMM-Net.
- Extended this work with ConvHuberMC-Net, introducing a convex Huber criterion and unfolded Majorization–Minimization framework to improve robustness to impulsive GMM noise, eliminate explicit singular value thresholding, and enable parallelizable computations. See [Report + Presentation](#).

### Directed Research Project

Spring 2023

Dr. Ihsan Ayub Qazi – [Network Systems Group @ LUMS](#)

Lahore, Pakistan

- Developed a *Shiny* app to predict digital literacy using a pre-trained Random Forest model. See [GitHub](#).

## PUBLICATIONS

### Wave-GMS: Lightweight Multi-Scale Generative Model for Medical Image Segmentation

Talha Ahmed, Nehal Ahmed Shaikh, and Hassan Mohy-ud-Din. Under review at ICASSP 2026. See [Github](#) | [arXiv](#).

### Unified Perspective on Diffusion Models: Theory, Practice, in Medical Imaging and Inverse Problems

Talha Ahmed and Nehal Ahmed Shaikh. Survey manuscript in preparation; See [Draft](#).

## TEACHING + WORK EXPERIENCE

### EE 563/MATH 325: Convex Optimization (Spring 2025)

Professor Hassan Mohy-ud-Din

Teaching Assistant

- Held weekly office hours, made and graded assignments, and engaged in semi-formal student counseling

### ACTA 6304: Advanced Machine Learning (Fall 2024)

Professor Momin Ayub Uppal

Teaching Assistant

- Held weekly office hours, made and graded assignments, and engaged in semi-formal student counseling

### CS 535: Machine Learning (Spring 2024)

Professor Momin Ayub Uppal

Teaching Assistant

- Held weekly office hours, invigilated quizzes and exams, held tutorials, made and graded assignments, and engaged in semi-formal student counseling

**EDUX 562: Data Lab (Spring 2023)**

Professor Ahmad Ayub

*Teaching Assistant*

- Held weekly office hours, invigilated STATA labs, graded assignments, and engaged in semi-formal student counseling

**ECON 221: Intermediate Macroeconomics (Fall 2022)**

Professor Usman Elahi

*Teaching Assistant*

- Held weekly office hours, conducted assignment tutorials, created/reviewed/invigilated/graded quizzes, created/reviewed/solved assignments, and engaged in semi-formal student counseling

**STATA Workshop (Dec 2022 - Jan 2023)**

Professor Usman Elahi

*Teaching Assistant*

- Assistant for Professor Usman Elahi ([usman.elahi@lums.edu.pk](mailto:usman.elahi@lums.edu.pk)) for 'Capacity Building and Training on Data Management & Analysis Using STATA' organized in collaboration with Bureau of Statistics, Government of Punjab for Statistical Officers.

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**UNDERGRADUATE COURSE PROJECTS/PRESENTATIONS****Speech Recognition and Translation System For Medical Communication**

Spring 2024

*CS 5302: Generative AI for Natural Language and Speech Processing*

- We aimed to develop an application that can interpret, translate, and vocalize spoken language in real-time, and is specifically catered for patient-doctor conversations.
- We integrated various open source models of Automatic Speech Recognition, Neural Machine Translation, and Text-to-Speech synthesis etc. See [Project Deliverables](#) | [Github](#).

**Reinforcement Learning Algorithms on Tic-Tac-Toe**

Fall 2023

*CS 6314: Dynamic Programming and Reinforcement Learning*

- Trained a reinforcement learning agent to play 2D and 3D Tic-Tac-Toe using algorithms like Value Iteration, Temporal Difference Learning, and Deep Q Networks. See [Project Report](#) | [Github](#).

**Panel Data and Tobit Analysis on Health Care Dataset**

Fall 2023

*ECON 438: Econometrics II*

- Conducted panel data and Tobit analysis on a German healthcare dataset to determine factors influencing doctor or hospital visits using fixed/random effects and tobit models. See [Project Report + Source Code](#).

**Clustering, Association and Frequent Pattern Mining**

Spring 2023

*CS 432: Introduction to Data Mining*

- Analyzed drug consumption patterns in Connecticut, USA using DBSCAN, Apriori, and Fpgrowth algorithms for clustering, association, and frequent pattern mining. See [Project Report](#).

**Sentiment Analysis on Audio Recordings**

Spring 2023

*CS 535: Machine Learning*

- Identification and extraction of features followed by a mathematical background of some popular machine learning methods and their performance evaluation. See [Project Report](#).

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**ACADEMIC DISTINCTIONS**

- Ranked in the **top 9%** of LUMS SBASSE Batch (300+ students) of 2024
- Placed on **Dean's Honor List (CGPA  $\geq 3.60$ )** for **2020-2021, 2021-2022, 2022-2023**
- Graduated with **Dean's Honour List and High Distinction (CGPA  $\geq 3.80$ )**

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**TECHNICAL SKILLS****Languages:** C++, Python, STATA, MATLAB, R, HTML/CSS**Programming Frameworks:** PyTorch, OpenCV, Shiny, Numpy, Pandas, HuggingFace, MONAI, Diffusers, Accelerate**Tools:** Linux, Git, Dropbox, L<sup>A</sup>T<sub>E</sub>X, Microsoft, VS Code, Google Colab, Jupyter Lab