Talha Ahmed

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Education & Research Background

Lahore University of Management and Sciences (LUMS) Sep. 2020 – May 2024
B.S Mathematics - Economics (Joint Major) + Minor in Computer Science *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. *Accepted 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
- Assitant for Professor Usman Elahi (usman.elahi@lums.edu.pk) for 'Capacity Building and Training on Data Management & Analysis Using STATA' organized in collaboration with Bureau of Statistcs, Government of Punjab for Statistical Officers.

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.

Academic Distinctions

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

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, LaTeX, Microsoft, VS Code, Google Colab, Jupyter Lab