Talha Ahmed

+92 331 4165009 | 24100033@lums.edu.pk | talha.123ahmed@live.com | talhaahmed2000.github.io |

EDUCATION

Lahore University of Management and Sciences   Sep. 2020 – Present
B.S Mathematics - Economics (Joint Major) + Minor in Computer Science   *CGPA/Minor GPA: 3.83/3.87*

RESEARCH EXPERIENCE

Research Assistant   Summer. 2023 – May. 2024
*Dr. Muhammad Tahir - **Linkedin***   *Lahore, Pakistan*
- Worked on **"Model Based Deep Learning"** as a Senior Project. (**Report + Presentation**)

Research Assistant   Sept. 2023 – Dec 2023
*Dr. Hassan Mohy-ud-Din - **Website***   *Lahore, Pakistan*
- Worked on a brief term project on compiling detailed, concise notes on prominent mathematical inequalities and their applications to fields of data science, information theory etc. Compiled work can be found here: **Dropbox**

Research Assistant   Jan. 2023 – May. 2023
Networks Systems Group @ LUMS   *Lahore, Pakistan*
- As a directed research project, developed an app for measuring 'Digital Literacy' under supervision of Dr. Ihsan Ayub Qazi - **Linkedin**.
- App can be found here: (**Github Link**)

RESEARCH PROJECTS

Unrolled Optimization & Matrix Completion   Summer. 2023 – May. 2024
Dr. Muhammad Tahir
- Implemented some popular Deep Learning Algorithms (**Github Link**)
- Self-taught preliminaries like *Duality Theory* and optimization techniques like *Augmented Lagrange Multiplier - ALM* etc to understand the problem formulation and solve Matrix Completion (MC).
- Replicated results of following papers **Paper 1**, **Paper 2** and prominent MC algorithms - (**Github Link**)
- Completed and refined a proposed *unfolded* ALM algorithm *ConvMC-Net* for standard matrix completion problem. (**Github Link**)
- Proposed *unfolded M-estimation* (**Paper 3**) based algorithm *ConvHuberMC-Net* for robust matrix completion in the event of impulsive Gaussian noise. (**Github Link**)

Mathematical Inequalities with Applications to Data Science   Sept. 2023 – Dec. 2024
Dr. Hassan Mohy-ud-Din
- Did readings on various prominent mathematical inequalities to field of data science and information theory
- Compiled reading materials from YouTube videos, journals, conference papers etc
- Each inequality is accompanied by essential background information, a proof, some intriguing considerations, practical applications, and a demonstration in Python/MATLAB.
- Example: **Jensen's Inequality**

Digital Literacy App Development   Jan. 2023 – May 2023
Networks Systems Group @ LUMS
- The digital literacy app posed as a sequel to the paper (**link**)
- Self-taught the inner workings of *shiny* framework in **R**
- Explored model deployment techniques within shiny and deployed a *Random Forest* machine learning algorithm
- The app evaluates a person's digital literacy score (between 0 and 1) given a set of answers to a questionnaire

ACADEMIC DISTINCTIONS

- Ranked in the **top 10%** of LUMS SBASSE Batch of 2024
- Placed on **Dean's Honor List** for **2020-2021, 2021-2022, 2022-2023**
- Projected to Graduate with **Dean's Honour List** and **High Distinction**

Relevant Coursework

- **MATH 439 (Applied Probability):** A-
- **CS 432 (Introduction to Data Mining):** A+
- **CS 535 (Machine Learning):** A+
- **MATH 325 (Convex Optimization):** A
- **CS 437 (Deep Learning):** A
- **CS 6314 (Dynamic Programming and Reinforcement Learning):** A
- **ECON 438 (Econometrics II):** A
- **CS 5302 (Generative AI for Natural Language and Speech Processing):** A
- **MATH 344 (Numerical Analysis):** A-
- **MATH 3010 (Advanced Calculus):** A-

Teaching + Work Experience

CS 535: Machine Learning (Spring 2024)   Professor Momin Ayub Uppal

Teaching Assistant

- Held weekly office hours, invigilated quizzes and exams, held tutorials, 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 - Jan2022)   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

- Developed a real-time speech recognition and translation system tailored for patient-doctor conversations integrating open-source ASR, NMT, and TTS models. (**Project Deliverables**), (**Github Link**)

Reinforcement Learning Algorithms on Tic-Tac-Toe   Fall 2023

CS 6314: Dynamic Programming and Reinforcement Learning

- We aimed to train an agent capable of playing 1) 2D Tic-Tac-Toe (3×3), 2) 2D Tic-Tac-Toe (4×4), 3) 3D Tic-Tac-Toe ($4 \times 4 \times 4$)
- We implemented algorithms like *Value Iteration, Temporal Difference Learning, Deep Q Networks etc* to tackle problems arising from vast huge spaces and more. (**Project Report**), (**Github Source Code**)

Panel Data and Tobit Analysis on Health Care Dataset   Fall 2023

ECON 438: Econometrics II

- Using a panel data German healthcare dataset, we explored the research question, *What are the factors that determine the number of recent doctor or hospital visits of an individual?*
- We addressed the research question using two methods: 1) Zooming in on a single cross-section and using *tobit* models, 2) Using panel data models involving *fixed, random* effects and their numerous variants

- Much attention was paid to whether key assumptions like *normality* for tobit models or presence of *serial auto-correlation* for panel data models were violated or not. (**Project Report + Source Code**).

Clustering, Association and Frequent Pattern Mining   Spring 2023

CS 432: Introduction to Data Mining

- Wrote a detailed report on data analysis of a drugs consumption related dataset (**PDF link**).
- The report focused on the various factors affecting drug consumption in Connecticut, USA
- State of the art algorithms for clustering like **DBSCAN**, **Apriori** and **Fpgrowth** for Association and Frequent Pattern Mining were employed to make data driven-inference regarding drug consumption in Connecticut, USA

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 (**PDF Link**).

Technical Skills

Languages: C++, Python, STATA, MATLAB, R, HTML/CSS, Tableau
Programming Frameworks: Keras, Tensorflow, PyTorch, OpenCV, Shiny, Numpy, Pandas, Matplotlib, Seaborn
Tools: Linux, Git, Dropbox, Latex, Microsoft, VS Code, Google Colab