

Talha Ahmed

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EDUCATION

Lahore University of Management and Sciences

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

Sep. 2020 – Present

CGPA/Minor GPA: 3.83/3.87

The Lahore Alma

A Level, Cambridge International Examinations

Aug. 2018 – May 2020

Grades: 4 A*s

RESEARCH EXPERIENCE

Research Assistant

Networks Systems Group @ LUMS

Jan. 2023 – May. 2022

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 Assistant

Dr. Muhammad Tahir - [Linkedin](#)

Summer. 2023 – May. 2024

Lahore, Pakistan

- Worked on "Model Based Deep Learning" as a Senior Project. ([Report](#) + [Presentation](#))

Research Assistant

Dr. Hassan Mohy-ud-Din - [Website](#)

Sept. 2023 – Dec 2023

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 PROJECTS

Digital Literacy App Development

Networks Systems Group @ LUMS

Jan. 2023 – May 2023

- 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

Unrolled Optimization & Matrix Completion

Dr. Muhammad Tahir

Summer. 2023 – May. 2024

- 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

Dr. Hassan Mohy-ud-Din

Sept. 2023 – Dec. 2024

- 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](#)

ACADEMICS RELATED

- 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

STATA Workshop

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 Statistics, Government of Punjab for Statistical Officers.

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

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

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

UNDERGRADUATE RESEARCH PROJECTS/PRESENTATIONS

Course Group Project on Arrhythmia Detection through ECG

Fall 2020

EE 100: Engineering Laboratory

- Implemented software capable of detecting different arrhythmia types through ECG data (**Project Video**).

Course Project on ISS Tracking and Velocity Measurment

Spring 2021

PHY 100: Experimental Physics Lab I

- Using real-time captured instances, and tools like Tracker and ImageJ, the velocity of ISS was predicted (**Lab Project Presentation**).

Analyzing Music Trend in the Last Century

Fall 2022

CS 334: Principles and Techniques of Data Science

- Wrote a blog post on *Medium* covering Explatory Data Analysis (**EDA**), Statistical Inference and Predictive Modelling on *Spotify* dataset to answer research questions pertaining to the trend of music in the last century. (**Blog Link**)

Econometric and Regression Analysis

Fall 2022

ECON 330: Econometrics I

- Carried out Econometric and Regression Analysis on a demographic dataset gathered from primary sources like survey questionnaire.

- The analysis focused on tackling the research question: "Does Gender have an effect on Academic Performance"
- Careful attention was paid to whether the standard *OLS* assumptions hold true for our model (**PDF link**).

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**).

Panel Data and Tobit Analysis on Health Care Dataset

Fall 2023

ECON 438: Econometrics II

- Using a german healthcare dataset which is of panel data nature, 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**).

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**)

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 for of Automatic Speech Recognition, Neural Machine Translation, and Text-to-Speech synthesis etc. (**Project Deliverables**), (**Github 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