

# Talha Ahmed

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## EDUCATION

### Lahore University of Management and Sciences

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

Sep. 2020 – Present

CGPA/Minor GPA: 3.81/3.85

### 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 – Present

Lahore, Pakistan

- Currently working on "Model Based Deep Learning" as a Senior Project.

## 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 withing 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 – Present

- Implemented some popular Deep Learning Algorithms ([Github Link](#))
- Currently doing a reading course on High Dimensional Data Analysis and Compressed Sensing. Primary text being followed is ([Book Link](#)) by John Wright and Yi Ma.
- Self-taught preliminaries like *Duality Theory* and optimization techniques like *Augmented Lagrange Multiplier - ALM* etc to understand the problem formulation and solve Matrix Completion.
- Replicated results of following papers [Link 1](#) and [Link 2](#)
- Completed and refined a proposed algorithm *ConvMC-Net* for standard matrix completion problem. ([Github Link](#))
- To handle robust matrix completion, currently drawing inspiration from Deep Learning techniques and applying it to the proposed *M-estimation* algorithm in paper [Link 3](#)

## 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**

## GRADUATE 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

## TEACHING + WORK EXPERIENCE

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### 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

## UNDERGRADUATE RESEARCH PROJECTS/PRESENTATIONS

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### 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 Exploratory 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 ( $3 \times 3$ ), 2) 2D Tic-Tac-Toe ( $4 \times 4$ ), 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**)

## TECHNICAL SKILLS

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**Languages:** C++, Python, STATA, MATLAB, R, HTML/CSS, Tableau

**Programming Frameworks:** Keras, Tensorflow, PyTorch, Shiny, Numpy, Pandas, Matplotlib, Seaborn

**Tools:** Linux, Git, Dropbox, Latex, Microsoft, VS Code, Google Colab