Muhammad Ayain Fida Rana

+92 330 8499999 | @ 25100045@lums.edu.pk | LinkedIn

Education

Lahore University of Management Sciences — Lahore, Pakistan
Bachelors of Science in Computer Science; ***CGPA: 3.97/4.00*** — *Sep 2021 - Present*
Relevant Coursework: Advanced Programming, Algorithms, Artificial Intelligence, Data Science, Data Structures, Databases, Digital Logic Circuits, *Distributed Systems*, *Machine Learning*, Network Centric Computing, *Network Security*, Operating Systems, *Operations Research*, Software Engineering, *Topics in LLMs* (Graduate courses are mentioned in *italics*)

Beaconhouse College Programme — Lahore, Pakistan
Cambridge Assessment International Education A Level; ***Grades: 4A**** — *Sep 2019 – May 2021*

Research Experience

Research Assistant — Lahore, Pakistan
Distributed and AI Systems Lab @ LUMS — *Aug 2023 – Present*

- Investigating browser caching strategies to improve web affordability by assessing the feasibility of reusing web content to reduce network data usage.
- Utilizing state-of-the-art LLMs, including vision and text-based models, for similarity analysis between web resources.
- Employed a systematic data scraping methodology using Selenium with FirefoxDriver to collect a unique dataset of over 40,000 image pairs for similarity analysis, extracting images, headlines, and alt text from the latest 10 articles across five categories on the top 50 news websites, demonstrating significant potential for reducing data transfer, with results indicating up to 10% greater byte savings compared to exact caching.
- Designed a cost-effective two-step pipeline to create replaceability matrices by using LLaVA-NeXT to generate image descriptions and feeding these descriptions into Llama 3.1 with context to obtain replaceability scores.
- Currently researching on techniques to identify and mitigate psychological biases in LLMs, focusing on improving fairness and decision-making in AI-driven applications.

Research Intern — Lahore, Pakistan
The Networks and Systems Group @ LUMS — *May 2023 – July 2023*

- Worked on the A Framework for Improving Web Affordability and Inclusiveness project under the guidance of Sarah Tanveer and Rumaisa Habib.
- Conducted a user study with 35 participants, comparing the quality of pages produced by Opera Mini, Brave, and HBS browsers.

Publications

Semantic Caching for Improving Web Affordability

Hafsa Akbar, Danish Athar, **Muhammad Ayain Fida Rana**, Chaudhary Hammad Javed, Zartash Afzal Uzmi, Ihsan Ayyub Qazi, Zafar Ayyub Qazi ***(Under review in ACM Web Conference 2025)***

Teaching Experience

CS 582: Distributed Systems (Fall 2024) — Dr. Zafar Ayyub Qazi
Teaching Assistant — *Sep 2024 – Dec 2024*

- Conducted weekly office hours and tutorials for over 70 students, created and graded quizzes, and implemented automated grading for assignments.
- Managed the course Slack channel, addressing student queries and facilitating discussions to enhance learning.

CS 5102: Algorithms (Fall 2024) — Dr. Imdad Ullah Khan
Teaching Assistant — *Sep 2024 – Dec 2024*

- Supported students on course's Slack channel, and engaged in semi-formal student counseling.
- Conducted weekly office hours for over 200 students, created/invigilated/graded quizzes, and provided feedback on homeworks.

CS 202: Data Structures (Spring 2024) — Dr. Ihsan Ayyub Qazi
Teaching Assistant — *Jan 2024 – May 2024*

- Managed course's Slack channel, created/reviewed/invigilated/graded quizzes and programming assignments.
- Held weekly office hours for over 100 students, providing additional academic support and guidance to students.

Development Projects

Succession Planning Portal | *React, JavaScript, Node.js, MongoDB, TensorFlow*

- Developed a robust and systematic framework that tracks and analyzes employee performance using advanced machine learning algorithms to predict outcomes and streamline decision-making.
- Focused on eliminating biases and enhancing meritocracy by emphasizing relevant performance metrics, ensuring a fair, transparent process that supports strategic talent development.

Distributed, Fault-Tolerant Key-Value Store | *Go*

- Implemented the Raft consensus algorithm based on the paper "*In Search of an Understandable Consensus Algorithm*" ensuring fault-tolerance and consistency in a distributed key-value store.
- It supports reliable data replication and coordination across distributed nodes with persistence.

Command Line Shell | *C*

- Programmed a minimal command-line interpreter that emulates core UNIX shell functionalities, including support for I/O redirection, piping output between commands, wildcards, and chaining commands in sequence.

User Level Threading Library | *C*

- Created a fairly abstracted threading library that, although utilized registers for storing PCBs, did application-level context switching.
- Implemented a Round Robin scheduler for thread management and developed concurrency and synchronization primitives to handle thread coordination and avoid conflicts.

SastaGPT | *Python, PyTorch, NumPy, Matplotlib, Pandas*

- Implemented a Transformer model from scratch based on the paper *"Attention Is All You Need"* trained on a language modeling task using preprocessed text from *Harry Potter and the Sorcerer's Stone*, gaining hands-on experience with Transformer architecture and training techniques.

Simple File System | *C*

- Developed a UNIX-like file system with partitions for superblocks, inodes, and datablocks, supporting file reading and writing, and operating between a simple shell program and a disk emulator.

RAG-Based Researcher Chatbot | *Python, LangChain, Pinecone, FAISS*

- Built a research assistant chatbot using LangChain that leverages Retrieval-Augmented Generation (RAG) to answer questions by retrieving relevant information from a collection of research papers and Wikipedia.

Automated Assignment Grading System with LLMs | *Python, Regex, Pandas*

- Developed an automated assignment grading system that utilizes regex to extract responses from LaTeX files, then applies few-shot learning and CoT reasoning to grade assignments based on a rubric, achieving 96% accuracy.

Awards & Honors

- Awarded Merit Scholarship (LUMS) for **2022-23, 2023-24, 2024-25**.
- Ranked in the **top 3%** of LUMS SBASSE Batch of 2025.
- Placed on Dean's Honor List for **2021-22, 2022-23, 2023-24**.
- **Top in World** in A Level Mathematics in **2020**.
- Roll of Honor **(Highest Student Award)** at Beaconhouse Johar Town in **2019**.

Skills

Languages: C/C++, Python, Go, JavaScript, TypeScript, Bash, Haskell, SQL, MATLAB, VBA

Frameworks: React, ExpressJS, PyTorch, MongoDB, TensorFlow, PyAutogui, PyTesseract

Tools: Linux, Git, Docker, Postman, VS Code, ADB, ChromeDevTools