Ahmad Mahmood

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Website

Education

ETH Zurich | **Sep. 2023 – Present**
Masters in Computer Science | *Zurich, Switzerland*

Lahore University Of Management Sciences (LUMS) | **Sep. 2019 – May 2023**
Bachelor of Science in Computer Science | *Lahore, Pakistan*

  cGPA: 3.8/4.0

Coursework

- Data Structures
- Discrete Mathematics
- Deep Learning
- Large Language Models
- General Topology
- Linear Algebra
- Multi variable Calculus
- Computer Vision
- Artificial Intelligence
- Probability
- Reliable and Trustworthy AI
- Linear & Combinatorial Optimization

Coursera
- Deep Learning Specialization (Link)

Research Publications

- **Ahmad Mahmood***, Muzammal Naseer*, Salman Khan, Fahad Khan, **Boosting Adversarial Transferability using Dynamic Cues** (*Accepted to the International Conference on Learning Representations (**ICLR '23**)*)

- **Ahmad Mahmood***, Ashmal Vayani, Muzammal Naseer, Salman Khan, Fahad Shahbaz Khan, **VURF: A General-purpose Reasoning and Self-refinement Framework for Video Understanding** (*Accepted to the **NeurIPS 2024** Workshop on Video-Language Models.*)

- Zuhao Liu, Aleksander Yanev, **Ahmad Mahmood**, Ivan Nikolov, Saman Motamed, Wei-Shi Zheng, Xi Wang, Luc Van Gool, Danda Pani Paudel, **InTraGen: Trajectory-controlled Video Generation for Object Interactions** (*Submitted to the IEEE/CVF Conference on Computer Vision and Pattern Recognition (**CVPR 2025**)*)

Experience

Institute for Computer Science, Artificial Intelligence and Technology | **April 2024 – December 2024**
Researcher | *Sofia, Bulgaria*
- Research Intern, Computer Vision department
- Conducted research on video generative diffusion models with trajectory-conditioned inputs.
- Co-authored a research paper submitted to CVPR
- Advisors: Dr. Danda Paudel, Dr. Luc Van Gool

Mohamed bin Zayed University of Artificial Intelligence | **March 2022 – August 2022**
Research Assistant - Internship | *Abu Dhabi, UAE*
- Worked as a research assistant for the computer vision department.
- Research on utilizing temporal information through frozen image models to improve adversarial transferability from Image-to-Video models.
- Later, researched the topic of video understanding through Large Language Models. Applied the technique of Visual Programming to video understanding tasks via in-context LLM learning.
- Advisors: Dr. Salman Khan, Dr. Muzammal Naseer

ETH Zurich | **September 2024 – Present**
Teaching Assistant | *Zurich, Switzerland*
- Assisting Dr. Michael Hoffman in the graduate level course, Algorithms Lab

Lahore University of Management Sciences | **June 2022 – June 2023**
Student Researcher | *Lahore, Pakistan*
- Worked on exploring how the insights of the Central Limit Theorem could be used to achieve robust performance in Federated Learning tasks over non-IID data.
- Supervised by Dr Ihsan Ayyub Qazi, Dr Agha Ali Raza and Dr Zafar Ayyub Qazi

Teaching Assistant | *Lahore, Pakistan*
- Assisting Dr Agha Ali Raza in the graduate level course, CS 535: Machine Learning

Projects

Heart Rhythm Classification from Raw ECG signals | *Python, Pytorch, Numpy* | <u>Github</u>   **November 2024**
- The project focuses on classifying entire time series of raw ECG signals into one of four classes
- The dataset comprises ECG recordings of varying lengths, sampled at 300Hz.
- Extracted features like PR intervals, QRS complex etc. using Neurokit2

Adversarial Robustness Verification Using DeepPoly for Neural Networks   **November 2024**
- Developed a verifier to analyze neural network robustness against adversarial perturbations using DeepPoly convex relaxation.
- Test and evaluate 17 pre-trained networks (MNIST and CIFAR10) to certify robustness.

Backdoor Vulnerabilities in Communication-based Reinforcement Learning | *Python*   **March 2024**
- Investigated the vulnerabilities of communication-based multi-agent reinforcement learning (MARL) systems to backdoor attacks
- By introducing a single malicious agent that sends deceptive messages, demonstrated how this disruption can propagate through the network, leading to suboptimal decision-making and degraded performance.

Trigger word detection using RNN | *Python, Numpy, Tensorflow Keras,Jupyter*   **September 2021**
- Implemented a bidirectional recurrent neural network using keras to detect trigger words in an audio file as part of the Sequence Models course on Coursera.
- Code not available on github due to coursera's honour code.
- Course certification available on Linkedin profile.

Tic-Tac-Toe AI | *Python*   **May 2021**
- Implemented the Min-Max algorithm to build an AI that plays the classic tic-tac-toe game against a person.
- Code available on github.

Honors and Awards/Extracurricular

Top 6 Mathematicians in Pakistan, International Mathematics Olympiad
- Represented Pakistan in the **International Mathematics Olympiad (IMO)** 2019 held in Bath, UK.
- Shortlisted from a pool of around 2000+ participants through series of camps.

Dean's Honour List
- The honor has been awarded to me in my first, second, and third year at LUMS, based on a cGPA of 3.85/4, 3.93/4, and 3.89/4 respectively.

Invited Reviewer
- ACML 2022

Competitive Programming
- **1st** place (Pakistan) in multiple Google Kickstart rounds.
- **2nd** place (LUMS) in one of Pakistan's largest programming contests conducted by IEEE LUMS Society, Codin' Guru 3.0

Sports
- Member of the School Football Team throughout A'Levels.
- Former member of the LUMS Football Team.
- Received gold and silver medals in various Table Tennis competitions.

Technical Skills

Programming: Python, C/C++, HTML, CSS, Javascript, Haskell, LaTeX
Frameworks: Pytorch, NodeJS, ReactJS, ExpressJS, Flask
Cloud Computing: Amazon Web Services(AWS), DigitalOcean
Version Control: Git, Github
Software: CUDA, Jupyter, Google Colab, VS Code, Sublime Text
Databases: MySQL, PostgreSQL, MongoDB