Usman Anwar

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Education

University of Cambridge, Cambridge, UK October 2022 - July 2026
PhD In Engineering (Machine Learning)
Advisor: David Krueger

Information Technology University, Lahore September 2019 – August 2021
MS Data Science (CGPA: 3.87, Rank: 2*nd*, Dean's Honours List)
Thesis Paper: Inverse Constrained Reinforement Learning (*published at ICML*)

University of Engineering and Technology, Lahore August 2015 – May 2019
BS Electrical Engineering (CGPA: 3.52)
Undergraduate Thesis/FYP: Single Channel Acoustic Source Separation And Speech Enhancement

Government College University, Lahore August 2013 – May 2015
Associate's Degree Pre-Engineering (Grade: A+)

Work Experience

Senior Machine Learing Engineer February 2020 – Present
Scientific Computing Department
NetSol Technologies, Lahore

Research Assistant & Graduate Student Fellow July 2019 – June 2020
Center of Artificial Intelligence and Computational Science
Information Technology University, Lahore
Research Advisor: Dr. Ali Ahmed

Research Intern July – September 2018
Internet of Things Laboratory
Khwarizmi Institute of Computer Science, Lahore
Research Advisor: Dr. Ubaid Ullah Fayyaz

Junior Data Scientist June – August 2017
ADDO AI, Lahore

Teaching Experience

Teaching Assistant - Discrete Mathematics September 2019 – January 2020
Department Of Computer Science
Information Technology University, Lahore

Conference Publications

** denotes equal contribution*

U. Anwar*, S. Malik*, A. Aghasi, and A. Ahmed. Inverse constrained reinforcement learning. In *Proceedings of the 38th International Conference on Machine Learning (ICML)*, 2021. URL https://arxiv.org/abs/2011.09999

Workshop Publications

D. Papadimitriou, **U. Anwar**, and D. Brown. Bayesian inverse constrained reinforcement learning. In *NeurIPS 2021 Workshop on Safe and Robust Control of Uncertain Systems*, 2021. (*Ongoing Work*)

S. Malik*, **U. Anwar***, A. Ahmed, and A. Aghasi. Learning to solve differential equations across initial conditions. In *ICLR 2020 Workshop on Integration of Deep Neural Models and Differential Equations*, 2020. URL arxiv.org/abs/2003.12159

Research Projects

Reward Hacking In Learned Reward Models December 2021 – Current
Senior Collaborators: Dr. David Kruger

The project focuses on developing a better understanding of reward hacking in reward model learned from preferences or demonstrations and developing strategies to mitigate such reward hacking behaviours.

Learning Constraints in the Context of Reinforcement Learning August 2020 – Current
Senior Collaborators: Dr. Ali Ahmed & Dr. Daniel Brown

The project explores the idea of using demonstrations from experts to solve the problem of reward misalignment in reinforcement learning.

Label Informed Imputation June 2021 – Current

Senior Collaborators: Dr. Ali Ahmed & Dr. Alireza Aghasi

The project explores improving imputation performance by utilizing the labels present in classification and regression tasks. This can allow accurate imputation in otherwise impossible scenarios.

Accoustic Source Separation Using Deep Learning September 2018 – May 2019

Undergraduate Senior Project • Advisor: Dr. Ubaid Ullah Fayyaz • Website: https://acoustic-source-separation.github.io/

Implemented Deep Clustering Algorithm (Hershrey et al. 2015) in tensorflow and demonstrated its efficacy for the purposes of single channel speech separation from two speaker mixture. As a novel contribution, we showed that this technique could also be used to separate noise from mixtures and used for purposes of speech enhacement.

Selected Industrial Projects

Explainable Decision Making

Implemented and customized various methods for explaining and interpreting decisions made by machine learning systems. These included, but not limited to, gradient based saliency maps, SHAP and LIME. Further, an empirical study was conducted to understand what method works best under what circumstances. The findings were used to make a plethora of already developed machine learning systems explainable.

Callibrated Classifier Learning With Imbalanced Data

Lead the development of a machine learning based classifier learned from imbalanced data. By training the classifier under focal loss, a callibrated classifier was achieved (Mukhoti et al. 2020) allowing the use of softmax probabiities as uncertainty estimate.

Zero Shot Recommendation Engine

Developed a novel proprietry method for providing zero shot recommendations to first time customers based only on their partial profile data.

Selected Course Projects

Paper Discovery System Via Topic Modelling December 2019

Course: Information Systems

Demonstrated that using Embedded Topic Model (Dieng et al. 2018), unlabelled papers from NeurIPS could be categorized into semantically meaningful topics (e.g. reinforcement learning, neuroscience *etc.*). The topics could be used for downstream tasks such as article recommendation.

Imitation Learning On Atari Games June 2020

Course: Deep Learning • Website: https://uzman-anwar.github.io/projects/2020/06/28/DL-Project/

Used Generative Adversarial Imitation Learning (Ho et al. 2016) to train a Reinforcement Learning agent from demonstrations of expert behaviour on two Atari games; *Pong* and *Breakout*.

Skills

• Python (Numpy, Scipy, Matplotlib) • Pytorch • Tenorflow • C • SQL • NoSQL

Awards & Honours

- *2022 Open Phil AI Fellowship* by Open Philanthrophy Foundation.
- *2022 Vitalik Buterin PhD Fellowship* by Future Of Life Institute.
- *Free Registration Award* at virtual MLSS 2021 Taipei.
- *Graduate Student Fellowship* for being the top student in ITU, Lahore MSDS Program.
- *Merit Scholarship*, ITU, Lahore.
- *Honourable Mention* in International Kangaroo Mathematics Contest, 2009.

Leadership Activities

Managing Director & Co-Founder Spectra Magazine April 2017 – May 2020

Spectra Magazine is a student-powered online magazine aiming to enhance public understanding of science and shape the narrative of science journalism in Pakistan. Under my leadership, we published more than 215 articles and mentored more than 50 high school and undergraduate students in science writing, editing and design. Read more about us at *www.spectramagazine.org/about*.

Mentoring

Abdul Rehman & Arslan Malik *for* Privacy Preserving Recommendation System (Ongoing)

Non-Degree Studies

Eastern European Machine Learning School *(July 2021)*