

# USMAN ANWAR

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## EDUCATION

<b>Information Technology University, Lahore</b> MS Data Science (CGPA: 3.84) Thesis Paper: Inverse Constrained Reinforcement Learning ( <i>published at ICML</i> )	September 2019 – Present
<b>University of Engineering and Technology, Lahore</b> BS Electrical Engineering (CGPA: 3.52) Undergraduate Thesis/FYP: Single Channel Acoustic Source Separation And Speech Enhancement	August 2015 – May 2019
<b>Government College University, Lahore</b> Associate's Degree Pre-Engineering (Grade: A+)	August 2013 – May 2015

## WORK EXPERIENCE

<b>Senior Machine Learning Engineer</b> Scientific Computing Department NetSol Technologies, Lahore	February 2020 – Present
<b>Research Assistant &amp; Graduate Student Fellow</b> Center of Artificial Intelligence and Computational Science Information Technology University, Lahore Research Advisor: Dr. Ali Ahmed	July 2019 – June 2020
<b>Research Intern</b> Internet of Things Laboratory Khwarizmi Institute of Computer Science, Lahore Research Advisor: Dr. Ubaid Ullah Fayyaz	July – September 2018
<b>Junior Data Scientist</b> ADDO AI, Lahore	June – August 2017

## TEACHING EXPERIENCE

<b>Teaching Assistant - Discrete Mathematics</b> Department Of Computer Science Information Technology University, Lahore	September 2019 – January 2020
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## PUBLICATIONS (IN REVERSE CHRONOLOGICAL ORDER)

\* denotes equal contribution

- 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
- 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>
- 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](https://arxiv.org/abs/2003.12159)

## RESEARCH PROJECTS

<b>Robust Imitation Learning With Respect to Dynamics</b> Senior Collaborators: Dr. Ali Ahmed The project explores imitation learning in the setting where the imitator agent and the demonstrator agent do not have identical dynamics and/or embodiments.	September 2021 – Current
<b>Learning Constraints in the Context of Reinforcement Learning</b> 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.	August 2020 – Current
<b>Label Informed Imputation</b> 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.	June 2021 – Current

## **Solving Partial Differential Equations Across Initial Conditions**

August 2019 – January 2020

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

Showed that using generative adversarial training, Physics Informed Neural Networks (Raissi et al. 2018) can be enabled to generalize across initial conditions. The work has applications in aerodynamics, computational fluid modelling and various other engineering and scientific fields.

## **Acoustic 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 (Hershey 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 enhancement.

## **SELECTED INDUSTRIAL PROJECTS**

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### **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 allowing the use of softmax probabilities 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**

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### **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*.

### **Cloud Based Online Retailer Transactions and Clickstream Analytics**

June 2020

Course: Big Data Analytics

Developed the backend of an eCommerce retailer website with the perspective of processing, storing, and analyzing large amounts of retail data. ETL pipelines were added to process and gather checkout, logging, user and sessions data in a scalable way. Further, different analytics were performed on this data using AWS Quicksight.

## **SKILLS**

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

## **LEADERSHIP ACTIVITIES**

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### **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. So far, it has published more than 215 articles and mentored more than 200 high school and undergraduate students in science writing, editing and design. Read more about us at [www.spectramagazine.org/about](http://www.spectramagazine.org/about).

## **AWARDS & HONOURS**

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- *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