Aamer Abdul

ar.aamer@gmail.com linkedin.com/in/aamer-ar/ github.com/Aamer98 Google Scholar

Research Interests

Vision Language Models, Robustness, Generalization, Explainability, Offline RL, and their applications to Climate and Healthcare

Education

Mila Quebec — ETS Montréal **2022 – 2024**
Research MSc in Computer Science *GPA: 3.91/4.30*
Focus: Machine learning and ML robustness. Advisor: Prof. Samira Ebrahimi Kahou

Birla Institute of Technology and Science, Pilani **2017 – 2021**
Bachelor of Engineering in Electronics and Communication Engineering *GPA: 8.67/10.00*

Research Experience

Parameter Efficient Fine-Tuning of Atmospheric Foundation Models — Mila, Quebec **Jan 2024 – present**
Supervisor: Samira E. Kahou, Karthik Mukkavilli (IBM), Lester Mackey (Microsoft)

- Working on effective and efficient fine-tuning regimes to adapt atmospheric ViT-based foundation models to wildfire modeling tasks. Under review at **AGU 2024**.
- Studied and implemented multiple parameter efficient fine-tuning methods such as LoRA, BitFit and SSF on foundation models with multi-modal remote sensing data.

Uncertainty Measures to Mitigate Model Unfairness in Healthcare — Mila, Quebec **Jan 2024 – present**
Supervisor: Samira E. Kahou, Bianca Dumitrascu (Columbia University)

- Exploring the use of uncertainty measures to detect and mitigate biased and unfair model behavior on decision making tasks on healthcare.
- Studied and implemented several uncertainty methods such as MC dropout, bayesian neural networks and deep ensembles.

Offline Reinforcement Learning for Medical Decision Making — Mila, Quebec **Sept 2022 – Dec 2023**
Supervisor: Samira E. Kahou, Vincent Michalski (University of Montreal)

- Proposed the Medical Decision Transformer (MeDT), a goal conditioned reinforcement learning framework for interpretable and interactive medical decision making. Spotlight at **NeurIPS 2023** workshop.
- Detailed performance validation using off-policy evaluation methods such as weighted importance sampling, fitted Q-evaluation, weighted doubly-robust and model-based algorithms.
- MeDT outperforms or is competitive with existing offline RL algorithms across multiple evaluation metrics.

Survey on Transformers in Reinforcement Learning — Mila, Quebec **Sept 2022 – Dec 2023**
Supervisor: Samira E. Kahou, Simon Prince (University of Bath)

- The survey covers the application of transformers in representation learning, transition and reward function modeling, and policy optimization within reinforcement learning.

Uncertainty Measures for Improved Concept Bottleneck Models — Mila, Quebec **May 2022 – Sept 2022**
Supervisor: Samira E. Kahou, Ivaxi Sheth (CISPA), Mohammad Havaei (Google)

- Devised an uncertainty based strategy, SIUL, to allow for more effective human-model interaction with concept bottleneck models. Accepted at **NeurIPS 2022** workshop.
- SIUL makes concept bottleneck models more robust to concept leakage, distribution shifts and adversarial attacks.

Impact of Normalization Layers on Cross Domain Few-Shot Transfer — Mila, Quebec **July 2021 – April 2022**
Supervisor: Samira E. Kahou, Eugene Belilovsky (Mila), Mohammad Havaei (Google)

- Devised Feature Normalization that improves few-shot generalization performance up to **6%** on shifted domains. Accepted at **CVPR 2022**.
- Feature Normalization improves robustness of few shot transfer to distribution shifts with negligible computational overhead.

Professional Experience

Mila, Quebec **July 2021 – April 2022**

ML Research Intern. Supervisor: Samira E. Kahou

- Explored and devised normalization schemes to improve performance of few-shot methods to extreme distribution shifts.
- Worked on improving the robustness of explainable concept bottleneck models to distribution shifts and adversarial attacks.

University of Toronto **Dec 2020 – June 2021**

ML Research Intern. Supervisor: Chi-Guhn Lee

- Studied and implemented adversarial domain adaptation methods for object detection in data-sparse settings.

Techrobotic FZCO, Dubai **June 2017 – Sept 2017**

Mechatronics Engineering Intern

- Programmed interactive applications for touch-screen kiosks. Technologies used: C++, Arduino.

Selected Publications

Efficient Fine-tuning of Atmospheric Foundation Models for Wildfire Modeling
*Under review **AGU 2024***
***Aamer Abdul Rahman**, Lester Mackey, Karthik Mukkavilli, Samira Ebrahimi Kahou*

Empowering Clinicians with Medical Decision Transformers: Paper Code
*Preprint: Under review **TMLR***
*Spotlight at **NeurIPS 2023** Workshop on Goal-Conditioned RL*
***Aamer Abdul Rahman**, Pranav Agarwal, Rita Noumeir, Philippe Jouvet, Vincent Michalski, Samira Ebrahimi Kahou*

Transformers in reinforcement learning: a survey: Paper
*Preprint: Under review **ACM Computing Surveys***
*Pranav Agarwal, **Aamer Abdul Rahman**, Pierre-Luc St-Charles, Simon JD Prince, Samira Ebrahimi Kahou*

Learning from uncertain concepts via test time interventions: Paper
***NeurIPS 2022** Workshop on Trustworthy and Socially Responsible ML*
*Ivaxi Sheth, **Aamer Abdul Rahman**, Laya Rafiee Sevyeri, Mohammad Havaei, Samira Ebrahimi Kahou*

Pitfalls of Conditional Batch Normalization for Contextual Multi-Modal Learning: Paper
***NeurIPS 2022** ICBINB Workshop*
*Ivaxi Sheth, **Aamer Abdul Rahman**, Mohammad Havaei, Samira Ebrahimi Kahou*

Revisiting Learnable Affines for Batch Norm in Few-Shot Transfer Learning: Paper Code
CVPR 2022
Moslem Yazdanpanah, **Aamer Abdul Rahman***, Muawiz Chaudhary, Christian Desrosiers, Mohammad Havaei, Eugene Belilovsky, Samira Ebrahimi Kahou*

Awards and Achievements

Master's Research Award: Received award worth $84,000 for pursuing a research masters at Mila.
Paper Spotlight: Spotlight paper at the NeurIPS 2023 workshop on Goal-Conditioned RL. (Top 10%)
Amii Talent Bursary: Received award worth $1500 to attend UpperBound 2024.
ICVSS 2024: Accepted for the 2024 International Computer Vision Summer School. (24% acceptance rate)
Tuition Fees Exception: Quebec exemption from international master's tuition fees.

Technical Skills

Programming: Python, R, C++, MATLAB, Octave, SQL
Frameworks & Tools: PyTorch, TensorFlow, Pandas, HuggingFace, Matplotlib, Flask, Scikit-Learn, AWS, Azure, Git, LaTeX
Relevant Coursework: Representation Learning, Computer Vision, Reinforcement Learning, Applied Machine Learning, Robotics, Foundations of Data Science
Mathematics: Linear Algebra, Multivariate Calculus, Probability and Statistics
Languages: English, French, Malayalam