

# Raihan Seraj

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🌐 [raihan-seraj.github.io](https://raihan-seraj.github.io) 🔄 Raihan-Seraj 📄 google scholar 🏠 Montreal QC, Canada

## EDUCATION

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**Mila - Quebec AI Institute and McGill University**, Montreal, Canada

PhD, Electrical and Computer Engineering

Jan 2019 – Apr 2025

**Mila - Quebec AI Institute and McGill University**, Montreal, Canada

MEng, Electrical and Computer Engineering

Jan 2017 – Jan 2019

**Islamic University of Technology**, Dhaka, Bangladesh

BSc, Electrical and Electronic Engineering

Dec 2011 – Dec 2015

**Affiliation:** *ILLS* (International Laboratory on Learning Systems).

## RESEARCH EXPERIENCE

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Time series modeling.

Multi-agent Reinforcement Learning.

Human in the loop systems.

Deep Learning.

## PROFESSIONAL EXPERIENCE

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**Machine Learning Scientist**

May 2025 – Present

**Bagel Labs**, San Francisco, USA

- Designed and implemented distributed reinforcement learning algorithm for fine-tuning large language models (LLMs) across globally distributed compute nodes, enabling scalable, high-throughput training and reducing convergence time by leveraging worldwide parallelism.
- Designed and built a robust reinforcement learning library for fine-tuning large language models (LLMs) on tool-use tasks.

**Senior ML Engineer**

Oct 2024 – April 2025

**Braxted Inc**, Toronto, Canada

- Led a multidisciplinary team of engineers and researchers in the successful design, development, and deployment of agentic Retrieval-Augmented Generation (RAG) systems tailored for Canadian immigration processes, enhancing retrieval accuracy and response reliability.
- Designed and implemented a robust long-term memory framework for conversational agents utilizing (LLM-OS) capabilities. The framework focused on enabling conversational agents to store, organize, and retrieve relevant information across extended interactions, significantly improving their ability to provide context-aware and personalized responses.

**Global Research Associate**

Aug 2023 – Feb 2024

**Borealis AI, Royal Bank of Canada**, Montreal, Canada*Mentors: Tristan Sylvain, Layla El Asri, Greg Mori*

- Designed AI model for event forecasting from large-scale text corpora via AutoCast++ using zero-shot ranking and transformer-based context retrieval.
- Developed entropy-based human feedback algorithms for contextual bandits, enhancing decision accuracy and model performance for real-time recommendation systems.

**Machine Learning Researcher (Scientist in Residence Program)**

June 2021–Sept 2021

**Valence Drug Discovery**, Montreal, Canada*Mentor: Daniel Cohen*

- Designed fibrous autoencoder architectures to learn latent molecular spaces that enable the generation of structurally diverse compounds while maintaining consistent bio-activity profiles.
- Formulated a reinforcement learning framework for scaffold hopping using latent molecular representations, collaborating with the R&D team to efficiently explore large chemical spaces and accelerate de novo drug discovery.

**AI Research Scientist Intern**

March 2020 – Oct 2020

**Paladin AI**, Montreal, Canada*Mentor: Mikhail Klassen*

- Improved pilot performance evaluation by 25% through feature-based segmentation of flight simulator data.
- Analyzed time series data from aircraft simulators to segment pilot reactions during faults, leading to the development of a proficiency metric for pilot performance evaluation.

**Research Scientist Intern**

March 2018 – May 2019

**Aerial Technologies**, Montreal, Canada*Mentors: Negar Ghourchian, Michel Allegue*

- Designed feature extraction algorithms for WiFi Channel State Information (CSI) data, which improved model generalization by addressing concept drift in real-time indoor localization systems.
- Analyzed time series data and trained deep learning models to classify fall detection using WiFi Channel State Information (CSI).

**Research Engineer**

Dec 2015 – Dec 2016

**Department of Biomedical Physics and Technology, University of Dhaka**, Dhaka, Bangladesh*Mentor: Khondkar Siddique-e-Rabbani*

- Designed learning algorithms to automatically classify QRS complexes, enabling the detection of acceptable ECG traces.
- Developed PC-based telemedicine system with integrated diagnostics, enabling 500 rural families to access real-time medical services online.
- Worked on software development for automatic frequency domain analysis to identify neurological disorders from evoked EMG responses.
- Engineered software interfacing for a 12-lead computerized ECG machine on Android, facilitating near real-time data transmission to and from remote areas.

## SELECTED PUBLICATIONS (A full list is available on Google Scholar.)

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1. **Raihan Seraj**, Aditya Mahajan, Jerome Le Ny. "Fatigue and task load dependent decision referrals for joint binary classification in human-automation teams" *IEEE Control Systems Letters*, 2025
2. **Raihan Seraj**, Aditya Mahajan, Jerome Le Ny. "Dynamic Estimation of Mental Workload and Operator Accuracy in Human Automation Teams" *IEEE Transactions on Human Machine Systems*, 2025
3. Qi Yan, **Raihan Seraj**, Jiawei He, Lili Meng, Tristan Sylvain. "Autocast ++: Enhancing world event prediction with zero-shot ranking based context retrieval". *International Conference on Learning Representation (ICLR)*, 2024.
4. Anurag Koul, Shivakanth Sujit, Shaoru Chen, Ben Evans, Lili Wu, Byron Xu, Rajan Chari, Riashat Islam, **Raihan Seraj**, Yonathan Efroni, Lekan P Molu, Miroslav Dudík, John Langford, Alex Lamb. "PcLast: Discovering Plannable Continuous Latent States". *International Conference on Machine Learning (ICML)*, 2024.
5. **Raihan Seraj**, Jivitesh Sharma, Ole-Christoffer Granmo. "Tsetlin Machine for solving contextual bandit problems". 35<sup>th</sup> *Conference on Neural Information Processing System (NeurIPS)*, 2022
6. **Raihan Seraj**, Jerome Le Ny, Aditya Mahajan. "Mean field approximation for large population beauty contest games". *IEEE Conference on Decision and Control (CDC)* 2021.
7. Jayakumar Subramanian, Amit Sinha, **Raihan Seraj**, Aditya Mahajan. "Approximate information state for approximate planning and reinforcement learning in partially observed environments". *Journal of Machine Learning Research (JMLR)*, 2020.
8. Riashat Islam, **Raihan Seraj**, Pierre-Luc Bacon, Doina Precup. "Entropy Regularization with Discounted Future State Distribution in Policy Gradient Methods". *NeurIPS Workshop on Optimization Foundations for Reinforcement Learning*, 2019.

## TECHNICAL SKILLS

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**Programming languages** – Python, SQL, Matlab, Java, C, Julia.

**Frameworks** – PyTorch, LangChain, HuggingFace Transformers, Scikit-Learn.

**ML Domains** – GenAI, NLP, Time-series Forecasting, Reinforcement Learning.

**Systems** – Linux, OSX.

## POSITIONS OF RESPONSIBILITY

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- **Consultancy:** Delivered expert consultancy and managed machine learning research interns at *Dreeven Technologies* and the *International Air Transport Association*, guiding them through complex projects and accelerating their professional growth.
- **Reviewer:** Reviewed for prestigious conferences such as NeurIPS 2021, ICML 2022, and ACC 2024, driving the advancement of research in the field.
- **Teaching Assistant:** Conducted tutorials and provided extensive support in graduate courses on computer organization, intelligent robotics, and algorithm design, enriching students' learning experiences and driving their academic success.