# Mahdi Gilany

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Personal Page | Google Scholar | LinkedIn

## Summary

**Background:** AI scientist with PhD and 7+ years of experience in machine learning and data science, combining academic and industry work. Proven success delivering scalable ML systems and contributing to algorithm design for tabular, vision, and time-series data in both research and production environments, with co-authored publications in NeurIPS, TMLR, and MICCAI.

**Applied ML Areas:** Computer Vision, Generative AI, Time-series Forecasting, Transformer, Self-supervise Learning, Medical Imaging. (Highly familiar with Large Language Models (LLM), NLP, and AI Agent)

**Professional Experience:** Led ML development and research at RBC Borealis, Queen's University, Vector Institute, and Octa Startup. Built modular codebases, integrated large-scale pipelines, and contributed to methods.

**Engineering Tools:** Python, PyTorch, Pandas, SQL, Scikit-learn, Hugging Face, W&B, Slurm, Git, Optuna. Extensive experience with large-scale data processing, distributed training, and experimentation workflows.

**Soft Skills:** Strong analytical and problem-solving abilities, excellent communication and presentation skills, a track record of innovation, and proven collaboration in cross-functional teams.

## Professional Experience

**Machine Learning Research Intern** Sep'24–Apr'25
RBC Borealis Toronto, Canada

- Designed and owned a **modular deep learning codebase** for tabular data modeling, adopted by other teams across RBC for feature selection and benchmarking tasks.
- Presented the codebase to multiple teams and led onboarding sessions to support adoption for internal workflows, while continuously adapting and troubleshooting it to meet team-specific needs.
- Led the integration of this codebase into a **large-scale mortgage prediction project** (13M rows, 2K features), including preprocessing of Polar DataFrames and model training and evaluation.
- Engineered a novel data preprocessing strategy and designed a custom dataloader and sampler, resulting in a 10% performance gain and 3× training speedup.
- Collaborated with the research team to enhance the underlying deep learning methodology (L1 regularization + proximal gradient descent algorithm), contributing to an ongoing **NeurIPS** submission.

**Research Assistant** Sep'21–Now
Queen's University Kingston, Canada

- Developed a novel entropy-based test-time adaptation method focusing on robustness and entropy calibration, improving performance by 5% under domain distribution shift.
- Contributed to developing a **multi-modal foundation model** for ultrasound, improving performance by 10% through contextual learning and data-efficient training.
- Designed a novel multi-instance learning framework utilizing **self-supervised pretraining and Transformer** aggregator to address weak annotations.
- Independently investigated contrastive learning with stochastic representation dimensionality inferred via variational inference for information maximization.
- Implemented a **comprehensive data pipeline and pre-processing** framework for ultrasound data, integrating automatic prostate segmentation, metadata-based cohort filtering, and stratified patient splits.
- Resulted in 11 collaborative publications in **MICCAI, IJCARS, and IEEE**.

**Student Affiliate Researcher** Jan'23–Now
Vector Institute Toronto, Canada

- Executed **large-scale deep learning experiments** by accessing state-of-the-art research infrastructure, including GPUs and high-performance computing servers.
- Engaged in a dynamic academic environment through seminars and workshops.

**Machine Learning Research Intern** May'23–Oct'23
RBC Borealis Toronto, Canada

- Proposed sparse regularization for **low SNR time-series forecasting**, enhancing robustness and interpretability of implicit neural bases; contributed to related method published in **TMLR**.
- Benchmarked existing coordinate-based neural networks, meta-learning approaches, and **sparse regularizations ($L_0$, $L_1$)** for better performance.

**Research Assistant** Sep'19–Jan'21
Rochester Institute of Technology Rochester, USA

- Designed a **probabilistic deep model** treating neural depth as a random process with potentially infinite growth, learning its posterior distribution from data; Resulted in a publication at **NeurIPS**.
- Developed dynamically expanding continual learner model to overcome fixed neural capacity.
- Researched on **VAEs with disentangled latent** representations and stochastic dimensionality.

**Machine Learning Engineer** Nov'18–Jul'19
Startup Studio Octa Tehran, Iran

- Prototyped an end-to-end RNN-based pipeline for crypto price prediction, operating with minimal structure in a fast-paced startup environment.

## Education

**Queen's University** Sep'21–Apr'25
PhD in CS, GPA:4.3/4.3, Supervisors: Dr. Parvin Mousavi, Dr. Purang Abolmaesumi Kingston, ON, Canada

**Rochester Institute of Technology** (Transferred to Queen's) Sep'19–Jan'21
PhD in CS, GPA:4.0/4.0, Supervisor: Dr. Rui Li Rochester, NY, USA

**University of Tehran** Sep'14–Sep'18
BSc in Electrical Engineering, GPA: 3.73/4.00 Tehran, Iran

## Honors and Awards

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| Vector Institute Research Grant | 2024 | NSERC MedICREATE | 2021–2025 |
| The Arts '49 Principal Wallace Fellowship | 2023-2024 | RIT PhD Merit Full Scholarship | 2019–2021 |

## Skills and Relavant Courses

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| Data Science Tools | NumPy, Pandas, Matplotlib, Scipy, XGBoost |
| Deep Learning Frameworks | PyTorch, TensorFlow/Keras, PyTorch Lightning |
| Programming Languages & other | Python, Bash, SQL, R, C/C++, Java, Jupiter Notebook, VS Code |
| Relevant Courses | Deep Learning, Statistical Analysis, **Reinforcement Learning**, Software Engineering, Linear Algebra, **Parallel Programming** |

## Notable Personal Projects

**Fast Generative Model for Functional Data**: Meta-learning with differentiable closed-form solvers for fast learning of data generation process with coordinate-based implicit neural representation networks.

**LLM Online Searcher Agent with Memory**: LangChain LLM-based agent to augment responses to queries with up-to-date online information with equipped conversational memory for chatting purposes.