Mahdi Gilany

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Google Scholar | LinkedIn | Github

Summary

Background: Over 7 years experience, including 2 years in industry, in designing, developing, and validating machine learning models, aiming at high performance and scalability. This comprises two research internships at RBC Borealis, extensive PhD research, Vector Institute affiliation, and ML engineering at Octa.

Publications: Contributions in top-tier AI venues such as NeurIPS, TMLR, and MICCAI.

Technical Expertise: Extensive experience in programming and ML engineering, with expertise in Python, PyTorch, Scikit-learn, XGBoost, Pandas. This is complemented by strong proficiency in distributed training, GPU clusters, Slurm, GitHub, W&B, gained through working on large-scale codebases and datasets, research experimentation, and collaborative development.

Foundational Expertise: Strong grounding in ML/DL fundamentals, including probability theory, statistics, linear algebra and optimization, with extensive research experience in areas such as Self-supervised Learning, Transformers, Foundation Models, Test-time Adaptation, and various Generative Models. This is complemented by my comprehensive understanding of Denoising Diffusions and LLM Agents, built through rigorous curiosity-driven self-study and mini-projects.

Professional Experience

Research Intern — RBC Borealis
Research Team: Photon — Sept'24–Now

- Developed a comprehensive codebase to facilitate the transfer of deep learning technologies and actively collaborated with multiple teams at RBC Borealis to ensure seamless adoption and integration.
- Integrated the codebase to RBC mortgage project featuring a large, industrial-scale dataset by developing custom dataloader and sampler classes to optimize training speed and ensure scalability.
- Collaborated with research team to enhance deep learning feature selection method for tabular data utilizing L1 regularization (Lasso), outperforming traditional decision tree-based approaches.

Graduate Student Researcher — Vector Institute
Vector Research Team — Jan'23–Now

- Gained access to state-of-the-art research infrastructure, including GPUs and high-performance computing servers, which enabled the execution of large-scale deep learning experiments.
- Engaged in a dynamic academic environment through participation in reading groups, seminars, and workshops, which kept me staying updated with the latest advancements in AI research.

Research Intern — RBC Borealis
Research Team: Photon — May'23–Oct'23

- Designed an interpretable, robust to low signal-to-noise ratio time-series forecasting method using deep time-index models and dictionary learning POV. Resulted in a collaborative TMLR paper.

Research Assistant — Queen's University
Medical Informatics Laboratory — Sept'21–Now

- Primary research on ultrasound-based tissue characterization, aiming to address four key challenges: labeled data scarcity, weak annotations, robustness to OOD, and generalization to distribution shift.

Developed a robust to low SNR test-time adaptation method to address distribution shift across clinical centers using calibrated entropy minimization. Resulted in MICCAI MLMI publication.

Developed a novel multi-instance learning framework utilizing self-supervised pretraining and Transformer-based pooling model. Resulted in IJCARS journal publication.

Designed out-of-distribution robust prostate cancer classifier, utilizing evidential deep learning for uncertainty quantification. Resulted in MICCAI publication.

Research Assistant RIT
Lab of Use-inspired Computational Intelligence Sept'19–Jan'21

Developed a probabilistic neural architecture selection method by learning the posterior distribution of neural network depth given the data using Variational Bayesian methods. Resulted in a Neurips publication.

Developed dynamically expanding continual learner model to overcome fixed neural capacity.

Machine Learning Engineer Octa Startup
Startup Studio Octa Nov'18–Jul'19

Developed RNN-based crypto currency price movement prediction model to find patterns in price time series and forecast the next moves of the candles.

Research Assistant University of Tehran
Secure Communication Lab Apr'18–Jul'18

Designed a CNN-based hand gesture detection model to identify various hand signs in real-time.

Education

Queen's University Ontario, Canada
PhD in Computer Science, GPA:4.3/4.3 Sept'21–Mar'25
Supervisor: Dr. Parvin Mousavi, Co-supervisor: Dr. Purang Abolmaesumi

Rochester Institute of Technology (Transferred to Queen's) New York, USA
PhD in Computer Science, GPA:4.0/4.0 Sept'19–Jan'21
Supervisor: Dr. Rui Li

University of Tehran Tehran, Iran
BSc in Electrical Engineering (major Communication), GPA: 3.73/4.00 Sept'14–Sept'18
Thesis supervisor: Dr. Mohammad Ali Akhaee

Selected Publications

For the full list of publications, please refer to Google Scholar Profile.

Theory Focused Publications

K. KC, R. Li, and *M. Gilany*, "Joint inference for neural network depth and dropout regularization", Neurips 2021. [Code]

*M. Gilany**, P. Wilson*, A. Jamzad, F. Fooladgar, M. N. N. To, B. Wodlinger, P. Abolmaesumi, and P. Mousavi, "TRUSformer: Improving Prostate Cancer Detection from Micro-Ultrasound Using Attention and Self-Supervision", IJCARS 2023. [Code]

M. Gilany, M. Harmanani, P. Wilson, M. N. N. To, A. Jamzad, F. Fooladgar, B. Wodlinger, P. Abolmaesumi, and

P. Mousavi, "Calibrated Diverse Ensemble Entropy Minimization for Robust Test-Time Adaptation in Prostate Cancer Detection", MICCAI MLMI Workshop 2024.

C. Shama Sastry, *M. Gilany*, K. Lui, M. Magill A. Pashevish, "DeepRRTime: Robust Time-series Forecasting with a Regularized INR Basis", TMLR 2025.

Application Focused Publications

M. Gilany, P. Wilson, A. Jamzad, F. Fooladgar, M. N. N. To, B. Wodlinger, P. Abolmaesumi, and P. Mousavi, "Towards confident detection of prostate cancer using high resolution micro-ultrasound", MICCAI 2022. [Code]

*M. Gilany**, P. Wilson*, A. Jamzad, F. Fooladgar, M. N. N. To, B. Wodlinger, P. Abolmaesumi, and P. Mousavi, "Self-supervised learning with limited labeled data for prostate cancer detection in high frequency ultrasound", IEEE TUFFC 2023. [Code]

Honors and Awards

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

Skills

Data Science Tools	NumPy, Pandas, Matplotlib, Scipy, PyTorch Lightning
Deep Learning Frameworks	PyTorch, TensorFlow/Keras
Programming Languages & other	Python, Bash, MATLAB, C/C++, SQL, Java, R, YAML

Relevant Courses

Deep Learning	Reinforcement Learning	Software Engineering	Parallel Programming
Statistical ML	Stochastic Processes	Linear Algebra	Geometric DL

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.

Variational Expandable Continual Learning: Joint posterior inference for both the architecture (M_t) and continual task stream (D_t), represented as $p(M_t, D_t|M_{t-1}, \{D_{t-1}, ..., D_1\})$, leveraging the beta-Bernoulli process and variational continual learning methodologies.

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.