Mahdi Gilany

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Google Scholar | LinkedIn | Github

Summary

Background: AI scientist with a PhD and 7+ years of experience in designing and implementing scalable, high-performance machine learning models.

Research Expertise: Self-supervised Learning, Generative Models, Probabilistic Deep Models, Sparse Coding and Feature Selection.

Professional Experience: Leading AI research and deployment at RBC Borealis (2x), Vector Institute, and Octa.

Engineering Skills: Extensive experience in Python, PyTorch, Pandas, GitHub, Slurm, W&B, Hugging Face, distributed training, Optuna Hyper-param Tuning, and large-scale dataset and fine-tuning.

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

Professional Experience

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

- Developed a comprehensive large-scale codebase, facilitating adoption and deployment of deep learning feature selection technology.
- Streamlined codebase integration and model training on RBC's large-scale mortgage dataset, with performance evaluated via A/B testing.
- Developed a custom dataloader and sampler, achieving a 10% performance gain and 3× speedup.
- Collaborated with research team to enhance deep feature selection method for tabular data utilizing L1 (Lasso) and proximal gradient descent, outperforming traditional decision tree-based approaches.

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

- 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.

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

- Proposed a sparse regularization for low SNR time-series forecasting, achieving robustness and interpretability of learned signal basis of deep time-index models.
- Benchmarked existing coordinate-based neural networks, meta-learning approaches, and sparse regularizations (L_0, L_1) for better performance.
- 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 an 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.

- Developed 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.

- Designed out-of-distribution robust cancer classifier, utilizing various uncertainty quantifications.

- Resulted in 11 collaborative publications in MICCAI, IJCARS, and IEEE.

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

- Designed a probabilistic deep model treating neural depth as a random process with potentially infinite growth, learning its posterior distribution from data.

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

- Researched on variational autoencoders (VAEs) with disentangled latent representations and stochastic dimensionality.

- Resulted in a Neurips publication.

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

- Built an RNN model and pipeline for crypto price movement prediction from historical data.

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, GPA: 3.73/4.00   Sept'14–Sept'18

Selected Publications

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

[Neurips'21] K. KC, R. Li, and *M. Gilany*, "Joint inference for neural network depth and dropout regularization" - Code

[IJCARS'23] *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" - Code

[MICCAI MLMI'24] *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"

[TMLR'25] C. Shama Sastry, *M. Gilany*, K. Lui, M. Magill A. Pashevish, "DeepRRTime: Robust Time-series Forecasting with a Regularized INR Basis"

Application Focused Publications

[MICCAI'22] *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" - Code

[IEEE TUFFC'23] *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" - 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.