HAMIDREZA KAMKARI

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CURRENT POSITION & EDUCATION

Layer 6 AI — Vector Institute *2024 - Ongoing*
Machine Learning Scientist
Working **full-time** at Layer 6 AI, successfully led two publications in top-tier conferences within a year, and mentoring undergraduate research students at the Vector Institute alongside the primary role at Layer 6 AI

University of Toronto *2022 - 2024*
Master of Science Mitaccs Accelerate Fellowship
Department of Computer Science

Sharif University of Technology *2018 - 2022*
Bachelor of Science Overall GPA 19.22/20
Department of Computer Engineering Ranked Among the *Top 10*
Courses: *(CE695)* Stochastic Processes, *(CE417)* Artificial Intelligence, *(CE494)* Bioinformatics, *(CE282)* Linear Algebra, *(CE181)* Probability and Statistics, *(CE354)* Algorithm Design, *(CE415)* Formal Languages, *(MAT034)* Differential Equations

PUBLICATIONS

- A Geometric Explanation of the Likelihood OOD Detection Paradox
  Hamidreza Kamkari, Brendan Ross, Jesse Cresswell, Anthony Caterini, Rahul Krishnan, Gabriel Loaiza-Ganem
  ICML 2024 (Poster): https://proceedings.mlr.press/v235/kamkari24a.html
- A Geometric View of Data Complexity: Efficient Local Intrinsic Dimension Estimation with Diffusion Models
  Hamidreza Kamkari, Brendan Ross, Rasa Hosseinzadeh, Jesse Cresswell, Gabriel Loaiza-Ganem
  NeurIPS 2024 (Under review with scores: 7, 7, 7, 6): https://arxiv.org/abs/2406.03537
  Accepted to three ICML 2024 workshops with two invited talks and spotlight presentations
- *A Geometric Framework for Understanding Memorization in Generative Models*
  Brendan Ross, *Hamidreza Kamkari*, Zhaoyan Liu, Tongzi Wu, George Stein, Gabriel Loaiza-Ganem, Jesse C. Cresswell
  Aiming for ICLR 2025 with two workshop acceptances so far at ICML 2024: https://openreview.net/forum?id=aq6btjS3ZG
- Order-based Structure Learning with Normalizing Flows
  *Hamidreza Kamkari**, Vahid Balazadeh*, Vahid Zehtab, Rahul Krishnan
  AAAI 2025 (Under Review): https://arxiv.org/abs/2308.07480

HONOURS AND AWARDS

- Secured **$30,000** in funding for graduate research through the Mitacs Accelerate Scholarship — May 2023
- Awarded the Regional **Gold Medal** in ICM-ICPC contests, with the team ranking 3rd overall — December 2018
- **Bronze Medalist** at the Asia Pacific Informatics Olympiad (APIO) contest — May 2018
- **Gold medalist** in the INFO-Cup worldwide programming contest — March 2018
- **Bypassed** university entrance exams by earning a gold medal in the Iranian National Olympiad in informatics and **achieving 5th place nationally** — September 2017
- **Silver medalist** in the Iranian National Olympiad in informatics — September 2016

OTHER RESEARCH EXPERIENCE

Vector Institute — **Toronto, Canada**
Graduate Research Assistant — *July 2024 - Ongoing*

- Began as a researcher at the Vector Institute under the supervision of Rahul Krishnan, exploring connections between generative models and causality, and currently mentoring undergraduate students in his lab

Bachelor Thesis — **Tehran, Iran**
Predicting Drug Combination Effects by Utilizing Multi-Omics Data — *January 2022 - September 2022*

- **(Thesis)** Multiple Drug Dose Response Prediction *(Written in Persian)*
- Used graph neural networks and attention mechanisms to create a general state-of-the-art framework for predicting drug dose response using SMILES representation of drugs
  Hamidreza Kamkari, Amin Ghareyazi, Karim Abbasi, Hamid Rabiee

Max Planck Institute for Informatics — **Saarbrücken, Germany**
Undergraduate Research Intern — *September 2020 - March 2022*

- Explored the mathematical foundations of slime mold inspired dynamics to solve semi-definite programs
- Physarum Inspired Dynamics to Solve Semi-Definite Programs
  Yuan Gao, *Hamidreza Kamkari*, Andreas Karrenbauer, Kurt Mehlhorn, Mohammadamin Sharifi
  Pre-print from the internship: `https://arxiv.org/abs/2111.02291`

ACADEMIC SERVICE

Peer Review

- International Conference on Learning Representations Reviewer — ICLR 2024 & 2025
- Association for the Advancement of Artificial Intelligence Program Committee — AAAI 2024
- International Conference in Machine Learning Reviewer — ICML 2024
- Neural Information Processing Systems Reviewer — NeurIPS 2023
- Transactions on Machine Learning Research (TMLR) Reviewer — Annual (Ongoing)

Talks

- Invited talk for workshop: Differentiable Almost Everything — ICML 2024
- Invited talk for workshop: Structured Probabilistic Inference and Generative Modelling — ICML 2024

Teaching Assistance — University of Toronto

- Introduction to Artificial Intelligence (CSC236) Alice Gao — *January 2023 - June 2023*
- Introduction to the theory of Computation (CSC236) François Pitt — *September 2022 - December 2022*

Teaching Assistance — Sharif University of Technology

- Artificial Intelligence (CE40417) Mohammad Hossein Rohban — *September 2021 - January 2022*
- **Head** of Data Structure and Algorithms (CE40254) - Mohammad Ghodsi — *January 2021 - June 2021*
- Artificial Intelligence (CE40417) Mohammad Hossein Rohban — *January 2021 - June 2021*
- Probability and Statistics (CE40181) Ali Sharifi-Zarchi — *September 2020 - January 2021*
- Discrete Structures (CE40115) Mohammad Ali Abam — *January 2020 - June 2020*
- Advanced Algorithm design (CE40354) Ali Sharifi-Zarchi — *January 2020 - June 2020*
- Data structure and Algorithms (CE40254) Mahdi Safarnejad-Boroujeni — *September 2019 - January 2020*

WORK EXPERIENCE

Layer 6 AI — Toronto-Dominion (TD) Bank — **Toronto, Canada**
Machine Learning Researcher (Full-Time) — *May 2024 - Ongoing*

- Began as a Research Scientist Intern and later transitioned to a full-time position
- Applying the manifold hypothesis in deep generative models to achieve a deeper understanding of phenomena such as out-of-distribution behaviour, memorization, and overall model quality
- Developing a tabular foundation model for Canada's largest bank utilizing prior fitted networks and a Bayesian approach

Vector Institute — **Toronto, Canada**
Graduate Researcher & Mentor — *July 2024 - Ongoing*

- Mentoring two University of Toronto undergraduates, affiliated with the Vector Institute, on their research projects

Fanap IT Company — **Tehran, Iran**
Machine Learning Engineer — *January 2022 - August 2022*

- Helped restore poorly taken photos of dental panoramic images
- Implemented a novel U-Net for dynamic range unification in PyTorch
- Created a demo using Docker and FastAPI for proof of concept and sold MVP to a client with three active radiology clinics in Tehran; all in three months

Max Planck Institute for Informatics — **Saarbrücken, Germany**
Undergraduate Research Intern — *September 2020 - March 2022*

- Explored the mathematical foundations of applying a slime mold inspired dynamics to solve semi-definite programs

Aalto University — **Espoo, Finland**
Undergraduate Research Intern — *July 2021 - September 2021*

- Helped complete a pipeline for RNA sequence design, with applications in bio-technology
- Integrated a graph neural network-based algorithm into a reinforcement learning pipeline to design complex RNA structures, including previously underexplored pseudo-knotted structures

National Olympiad in Informatics Committee — **Tehran, Iran**
Supervisor & Mentor — *September 2020 - December 2021*

- Curated and organized nationwide competitive contests for talented students all across Iran
- Helped maintain the technical infrastructure of the online code judging system

High Schools Across Iran — **Tehran, Iran**
Computer Olympiad Teacher — *September 2018 - September 2021*

- Worked as Computer Olympiad Teacher in well-known Iranian high schools
- Mentored at the International Olympiad in Informatics (IOI) preparation camp for the event held in Baku, Azarbaijan