HAMIDREZA KAMKARI

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EDUCATION

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

Courses: *(CSC2541)* Topics in Machine Learning: Introduction to Causality (A+), *(CSC2240)* Graphs, Matrices, and Continuous Optimization (A+), *(CSC2701)* Communication for Computer Scientists (A+), *(CSC2541)* Advanced Topics in ML: Causal-aware Representation Learning (A), *(CSC2130)* Empirical Research Methods in Software Engineering (A+)

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

National Olympiad in Informatics   *2016 - 2017*
High School — Young Scholars Club (YSC)   Gold (2017) and Silver (2016) Medal
Iranian National Olympiad in Informatics   Ranked *5th* in the Country

One of few who **bypassed** university entrance exams by earning a gold medal in nationwide competitions.

Courses: Competitive Programming, Algorithms, Data Structures, Computational Geometry, Graph Theory, Combinatorics

RESEARCH AND PUBLICATIONS

Layer 6 AI — University of Toronto   **Toronto, Canada**
Deep Generative Modelling through the Lens of the Manifold Hypothesis   *May 2023 - Ongoing*

· *Led* two publications in top-tier conferences within *less than a year.*

· **(Publication)** 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://arxiv.org/abs/2403.18910
  Workshop @ ICLR 2024: Generative Models for Decision Making

· **(Publication)** 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 excellent scores: 7, 7, 7, 6): https://arxiv.org/abs/2406.03537
  Workshop @ ICML 2024: Structured Probabilistic Inference and Generative Modelling **(Oral)**
  Workshop @ ICML 2024: Differentiable Almost Everything **(Oral)**
  Workshop @ ICML 2024: Geometry-grounded Representation Learning and Generative Modeling

· **(Publication)** *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 acceptance: https://openreview.net/forum?id=aq6btjS3ZG
  Workshop @ ICML 2024: Geometry-grounded Representation Learning and Generative Modeling
  Workshop @ ICML 2024: Next Generation AI Safety

Vector Institute — University of Toronto   **Toronto, Canada**
Causality and Tabular Modelling   *November 2022 - Ongoing*

- **(Publication)** Order-based Structure Learning with Normalizing Flows
  Hamidreza Kamkari[*], Vahid Balazadeh[*], Vahid Zehtab, Rahul Krishnan
  AAAI 2024 (Under Review): `https://arxiv.org/abs/2308.07480`

- **(Research Mentoring)** Guiding an undergraduate researcher at the University of Toronto in developing tabular in-context models using prior-fitted networks (PFNs) for causal inference.

Sharif University of Technology   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

Maxplanck Institute of Informatics (MPI-INF)   Saarbrücken, Germany
Convex Optimization and Linear Algebra   *August 2020 - February 2022*

- **(Publication)** Physarum Inspired Dynamics to Solve Semi-Definite Programs
  Yuan Gao, *Hamidreza Kamkari*, Andreas Karrenbauer, Kurt Mehlhorn, Mohammadamin Sharifi
  Pre-print: `https://arxiv.org/abs/2111.02291`

ACADEMIC SERVICE

Peer Review & Talks
- 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)
- Poster Talk for Workshop: Differentiable Almost Everything   ICML 2024
- Invited Talk for Workshop: Structured Probabilistic Inference and Generative Modelling   ICML 2024

Academic Teaching Assistance   University of Toronto - Sharif University of technology
- Introduction to Artificial Intelligence (CSC236) Alice Gao   *January 2023 - Ongoing*
- Introduction to the theory of Computation (CSC236) François Pitt   *September 2022 - December 2022*
- Artificial Intelligence course (CE40417) Mohammad Hossein Rohban   *September 2021 - January 2022*
- **Head** of Data Structure and Algorithms course (CE40254) - Mohammad Ghodsi   *January 2021 - June 2021*
- Artificial Intelligence course (CE40417) Mohammad Hossein Rohban   *January 2021 - June 2021*
- Probability and Statistics course (CE40181) Ali Sharifi-Zarchi   *September 2020 - January 2021*
- Discrete Structures course (CE40115) Mohammad Ali Abam   *January 2020 - June 2020*
- Advanced Algorithm design course (CE40354) Ali Sharifi-Zarchi   *January 2020 - June 2020*
- Data structure and Algorithms course (CE40254) Mahdi Safarnejad-Boroujeni *September 2019 - January 2020*

HONOURS AND AWARDS

🔗 **ACM-ICPC**	🔗 **APIO**	🔗 **INFO-Cup**	🔗 **Mitacs Fellowship**
Regional Gold Medal	Asia-Pacific Informatics	Worldwide Programming	Received $30,000 Funding
Team Ranked 3rd	Bronze Medal	Contests Gold Medal	for Graduate Research
December 2018	*May 2018*	*March 2018*	*May 2023 - December 2023*

WORK EXPERIENCE

Layer 6 AI — Toronto-Dominion (TD) Bank   Toronto, Canada
Machine Learning Researcher (Full-Time)   *May 2023 - Ongoing*

- Specialized in generative modeling with a focus on the manifold hypothesis for general research, as well as tabular data modeling for the banking sector.
- Contributed to setting a company-wide record for the number of publications at a single conference by being the first author of a poster and three workshop papers at ICML 2024.
- Led two projects on the intrinsic dimensions of data manifolds in deep generative models, achieving successful publications in less than a year.
- Integrating causal knowledge into tabular foundation models for enhanced tabular modelling.

Fanap IT Company
Machine Learning Engineer

Tehran, Iran
January 2022 - August 2022

- Research and development on deep learning methods to help restore poorly taken photos of dental panoramic images that prevents reshooting and additional x-ray exposure, and additionally, help with the tooth disease detection pipeline of dentists.
- Implemented a novel U-Net for dynamic range unification using Pytorch that can help panoramic image restoration.
- Detectron2 Mask-RCNN for instance segmentation of teeth and treatments that can help computer-aided disease detection. 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 approximately three months.

Max Planck Institute for Informatics
Undergraduate Research Intern

Saarbrücken, Germany
January 2022 - March 2022

- Investigated the complexity of fine-tuning neural networks, focusing on bias terms in one-hidden layer models. Demonstrated that optimizing these weights deterministically demands super-exponential processing time.

Aalto University
Undergraduate Research Intern

Espoo, Finland
July 2021 - September 2021

- Designing beneficial RNA structures is challenging in biotechnology. We use reinforcement learning algorithms combined with graph neural networks to model and design RNA sequences, obtaining previously underexplored structures like RNA pseudo-knots.

National Olympiad in Informatics Committee
Supervisor & Mentor

Tehran, Iran
September 2020 - December 2021

- Curated and organized nationwide competitive contests for talented students all across Iran; helped with the technical infrastructure of the online code judging system using CMS online judge.

Teaching
High-school Computer Olympiad Teacher

Tehran, Iran
September 2018 - September 2021

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

January 2019
February 2019

SKILLS

Programming Skills:

Pytorch, Lightning, Mlflow, Weights & Biases, Hydra, scikit-learn, Docker, C++, Java, MATLAB, LaTeX.

Languages:

Persian (Native) - English (Fluent)
TOEFL iBT (116/120) — IELTS General (8.5/9)