Mahdi Haghifam

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Education

University of Toronto and Vector Institute *Sept 2017 – May 2023*
Ph.D in Electrical and Computer Engineering Department.
- **Advisor:** Prof. **Daniel Roy**
- **Dissertation Topic:** Information-Theoretic Measures of Generalization in Machine Learning (link)

Sharif University of Technology *Sept. 2010 – Aug. 2016*
B.Sc and M.Sc in Electrical Engineering Department.

Employment

Research Assistant Professor, Toyota Technological Institute at Chicago (TTIC), Chicago. Info about the role. *Sept. 25–Present*

Distinguished Postdoctoral Fellow, Khoury College of Computer Science, Northeastern University, Boston. Info about the role. *Sept. 23–Aug. 25*
Advisor: **Jonathan Ullman** and **Adam Smith**.

Research Intern, Google DeepMind, California, U.S. *Sept. 22–Dec. 22*

Research Intern, ServiceNow Research, Toronto, Canada *Nov. 20–Mar. 21*

Graduate Student Researcher, Vector Institute for AI, Toronto, Canada *Mar. 20–Aug. 23*

Research Assistant, University of Toronto & Vector Institute, Toronto, Canada *Sept. 17–Aug. 23*

Honors & Awards

Simons Institute (UC Berkeley) Research Fellowship Award *2025*

Best Paper Award at ICML 2024 (top 10 of 10,000 submissions) *2024*

Khoury College of Computer Sciences Distinguished Postdoctoral Fellowships *2023*

Czeslaw and Irene Klawe Scholarship from University of Toronto *2023*

Henderson and Bassett Research Fellowship from University of Toronto *2023*

Viola Carless Smith Research Fellowship from University of Toronto *2023*

Top 8% of reviewers at NeurIPS *2021,2023*

MITACS Accelerate Fellowship *2019,2021*

Publications

The Sample Complexity of Membership Inference and Privacy Auditing
M. Haghifam, A. Smith, J. Ullman ($\alpha\beta$)
arXiv:2508.19458 (Preprint, 2025).

On the Traceability in ℓ_p Stochastic Convex Optimization
S. Voitovych*, **M. Haghifam***, I. Attias, G. K. Dziugaite, R. Livni, D. M. Roy
arXiv:2502.17384 (Preprint, 2025). Highlight Track at FORC 2025.

Private Geometric Median
M. Haghifam, T. Steinke, J. Ullman ($\alpha\beta$)
NeurIPS 2024. arXiv:2406.07407.

Information Complexity of Stochastic Convex Optimization: Applications to Generalization and Memorization
I. Attias, G. K. Dziugaite, **M. Haghifam**, R. Livni, D. M. Roy ($\alpha\beta$)
ICML 2024. Best Paper Award (Top 10 of 10,000 submissions). arXiv:2402.09327.

Faster Differentially Private Convex Optimization via Second-Order Methods

A. Ganesh, **M. Haghifam**, T. Steinke, A. Thakurta ($\alpha\beta$)

NeurIPS 2023. arXiv:2305.13209.

Why Is Public Pretraining Necessary for Private Model Training?

A. Ganesh, **M. Haghifam**, M. Nasr, S. Oh, T. Steinke, O. Thakkar, A. Thakurta, L. Wang ($\alpha\beta$)

ICML 2023. arXiv:2302.09483.

Limitations of Information-Theoretic Generalization Bounds for Gradient Descent Methods in Stochastic Convex Optimization

M. Haghifam*, B. Rodríguez-Gálvez*, R. Thobaben, M. Skoglund, D. M. Roy, G. K. Dziugaite

ALT 2023. arXiv:2212.13556.

Privacy-Preserving and Approximately Truthful Local Electricity Markets: A Differentially Private VCG Mechanism

M. Hoseinpour, M. Hoseinpour, **M. Haghifam**, M. R. Haghifam

IEEE Transactions on Smart Grid, 2023. IEEE Xplore (10201886).

Understanding Generalization via Leave-One-Out Conditional Mutual Information

M. Haghifam, S. Moran, D. M. Roy, G. K. Dziugaite

ISIT 2022. arXiv:2206.14800.

Towards a Unified Information–Theoretic Framework for Generalization

M. Haghifam, G. K. Dziugaite, S. Moran, D. M. Roy

NeurIPS 2021 (Spotlight, $< 3\%$ of submissions). arXiv:2111.05275.

Information-Theoretic Generalization Bounds for Stochastic Gradient Descent

G. Neu, G. K. Dziugaite*, **M. Haghifam***, D. M. Roy*

COLT 2021. arXiv:2102.00931.

On Streaming Codes With Unequal Error Protection

M. Haghifam*, M. N. Krishnan*, A. Khisti, X. Zhu, W.-T. Tan, J. Apostolopoulos

IEEE Journal on Selected Areas in Information Theory, 2021. PDF.

Sequential Classification with Empirically Observed Statistics

M. Haghifam, V. Y. F. Tan, A. Khisti

IEEE Transactions on Information Theory, 2021. PDF.

Sharpened Generalization Bounds based on Conditional Mutual Information and an Application to Noisy, Iterative Algorithms

M. Haghifam, J. Negrea, A. Khisti, D. M. Roy, G. K. Dziugaite

NeurIPS 2020. arXiv:2004.12983.

Information-Theoretic Generalization Bounds for SGLD via Data-Dependent Estimates

J. Negrea*, **M. Haghifam***, G. K. Dziugaite, A. Khisti, D. M. Roy

NeurIPS 2019. arXiv:1911.02151.

Joint Sum Rate And Error Probability Optimization: Finite Blocklength Analysis

M. Haghifam, M. Robat Mili, B. Makki, M. Nasiri-Kenari, T. Svensson

IEEE Wireless Communications Letters, 2017. PDF.

Industry Research Experience

Research Intern. *Mountain View, CA*
Google DeepMind. Mentor: **Thomas Steinke** *Sept. 2022 – Dec. 2022*

- Conducted research on improving differentially private optimization.
- Resulted in publications in ICML2023 (link), NeurIPS2023 (link), and NeurIPS2024 (link).

Research Intern. *Toronto, ON*
ServiceNow Research Mentor: **Gintare Karolina Dziugaite** *Nov. 2020 – March 2021*

- Studied the connections between different generalization approaches in ML.
- Resulted in publication in NeurIPS 2021 (spotlight) (link).

Research Intern. *Toronto, ON*
ServiceNow Research Mentor: **Gintare Karolina Dziugaite** *Feb. 2019 – May. 2019*

- Proposed a new analytical technique that measures algorithmic stability on random subsets of data, creating a tighter and more empirically accurate connection between the training process and real-world performance.
- Resulted in publication in NeurIPS 2019 (link).

Selected Talks

Apple – Apple ML Privacy Team	*Aug. 2025*
UCSD – Information Theory and Applications Workshop	*Feb. 2025*
Northwestern and TTIC – Junior Theorists Workshop	*Dec. 2024*
University of Oslo – Integreat Center	*Sept. 2024*
Google – Statistical Learning Theory	*July 2024*
Google DeepMind – Optimization Group	*May 2024*
TOC4Fairness Seminar – Online Seminar	*May 2024*
Northeastern – Theory Lunch	*Mar. 2024*
MIT – Tomaso Poggio's Research Group	*Nov. 2023*
Boston-Area Data Privacy Seminar	*Oct. 2023*
McMaster University – Department of Computing and Software	*June 2023*
University of Minnesota – Network and Information Sciences Seminar Series	*Mar. 2023*
Harvard University – Flavio Calmon's Research Group	*Mar. 2023*
Google – Privacy in Machine Learning Seminar	*Dec. 2022*
Google – Information Theory Seminar	*Sept. 2022*
Canadian Workshop on Information Theory – Ottawa	*June 2022*
Microsoft Research – Montreal	*Jan. 2022*
IIMAS, Mexico – Information Theory, Machine Learning and Statistics Seminar	*Apr. 2021*

Service

Area Chair

- Conference on Algorithmic Learning Theory (ALT) 2026.
- Conference on Secure and Trustworthy Machine Learning (SaTML) 2024, 2026.
- Theory and Practice of Differential Privacy Workshop 2024, 2025.
- Eastern European Machine Learning Summer School 2022.

Conference Reviewer: Conference on Neural Information Processing Systems (**NeurIPS**), International Conference on Machine Learning (**ICML**), International Conference on Learning Representations (**ICLR**), Conference on Learning Theory (**COLT**), International Symposium on Information Theory (**ISIT**).

Journal Referee: IEEE Transactions on Signal Processing. Journal of Machine Learning Research, Transactions on Machine Learning Research.

Programming Skills

Languages: C,C++, Python (Scipy, Numpy), TensorFlow, JAX, PyTorch

Leadership & Extra-Curricular Activities

Organizer — Charles River Privacy Day, Boston, MA *2024*

Co-organizer — Boston Area Differential Privacy Seminar *2023–2024*

- Coordinated speakers and scheduling; co-led outreach and logistics across Boston-area universities.

Mentor — Graduate Application Assistance Program (GAAP), University of Toronto *2020–2024*

- Volunteer mentoring on research statements, CVs, and graduate school applications.(program link)

Executive Member — Bahar Charity Group, University of Toronto *Aug. 2020 – Aug. 2023*

- Helped organize fundraising and student-support initiatives.(baharcharity.com)