Mahdi Haghifam

Curriculum Vitae

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Current Employment

Sept. 23–Present **Distinguished Research Fellow, Khoury College of Computer Science, Northeastern.**
Working on Differential Privacy and Foundation of ML.
Host: Prof. Jonathan Ullman and Prof. Hongyang R. Zhang.

Education

2017-2023 **Ph.D, University of Toronto**, Toronto, Ontario, Canada, August 2023.
Electrical and Computer Engineering Department.
Dissertation Topic: "Information-Theoretic Measures of Generalization in Machine Learning"
Advisor: Prof. Daniel M. Roy

2014–2016 **M.Sc, Sharif University of Technology**, Tehran, Iran.
Electrical Engineering.

2010–2014 **B.Sc, Sharif University of Technology**, Tehran, Iran.
Electrical Engineering, Major in Communication Systems.

Past Employment

Sept. 17–Aug. 23 **Research Assistant, University of Toronto and Vector Instiuite, Canada.**
Advisor: Prof. Daniel Roy

Aug. 22–Dec. 22 **Research Intern, Google Brain, California, U.S.**
Mentors: Dr. Thomas Steinke and Dr. Abhradeep Guha Thakurta

Nov. 20–Mar. 21 **Research Intern, Element AI-Service Now, Toronto, Canada.**
Mentor: Dr. Gintare Karolina Dziugaite

Mar. 20–May 20 **Visiting Researcher, Institute for Advanced Studies, Princeton, U.S.**

Feb. 19–May 19 **Research Intern, Element AI, Toronto, Canada.**
Mentor: Dr. Gintare Karolina Dziugaite

Publications

*: equal-contribution. $\alpha\beta$: alphabetic authorship

pre-print

1. I. Attias, G. K. Dziugaite, **M. Haghifam**, R. Livni, D. M. Roy ($\alpha\beta$) "Information Complexity of Stochastic Convex Optimization: Applications to Generalization and Memorization", Under Review

Conference

1. A. Ganesh, **M. Haghifam**, T. Steinke, A. Thakurta, $(\alpha\beta)$ " Faster Differentially Private Convex Optimization via Second-Order Methods", NeurIPS 2023
2. A. Ganesh, **M. Haghifam**, M. Nasr, S. Oh, T. Steinke, O. Thakkar, A. Thakurta, L. Wang, $(\alpha\beta)$ " Why Is Public Pretraining Necessary for Private Model Training?", ICML 2023.
3. **M. Haghifam***, B. Rodríguez-Gálvez*, R. Thobaben, M. Skoglund, D. M. Roy, G. K. Dziugaite, "Limitations of Information-Theoretic Generalization Bounds for Gradient Descent Methods in Stochastic Convex Optimization", ALT 2023.
4. **M. Haghifam**, G. K. Dziugaite, S. Moran, D. M. Roy, "Understanding Generalization via Leave-One-Out Conditional Mutual Information", ISIT 2022.
5. **M. Haghifam**, S. Moran, D. M. Roy, G. K. Dziugaite, "Towards a Unified Information–Theoretic Framework for Generalization", NeurIPS 2021 (Spotlight, $<3\%$ of submissions).
6. G. Neu, G. K. Dziugaite, **M. Haghifam**, D. M. Roy , "Information-Theoretic Generalization Bounds for Stochastic Gradient Descent", COLT 2021.
7. **M. Haghifam**, J. Negrea, A. Khisti, D. M. Roy , G. K. Dziugaite, "Sharpened Generalization Bounds based on Conditional Mutual Information and an Application to Noisy, Iterative Algorithms", NeurIPS 2020.
8. J. Negrea*, **M. Haghifam***, G. K. Dziugaite, A. Khisti, D. M. Roy, "Information-Theoretic Generalization Bounds for SGLD via Data-Dependent Estimates", NeurIPS 2019.

Journal

1. M. Hoseinpour, M. Hoseinpour, **M. Haghifam**, M. Haghifam, "Privacy-Preserving and Approximately Truthful Local Electricity Markets: A Differentially Private VCG Mechanism", IEEE Transactions on Smart Grid.
2. **M. Haghifam***, M. N. Krishnan*, A. Khisti, X. Zhu, W. Dan and J. Apostolopoulos, "On Streaming Codes With Unequal Error Protection", IEEE Journal on Selected Areas in Information Theory.
3. **M. Haghifam**, V. Y. F. Tan, and A. Khisti, "Sequential Classification with Empirically Observed Statistics", IEEE Transactions on Information Theory.
4. **M. Haghifam**, M. Robat Mili, B. Makki, M. Nasiri-Kenari, T. Svensson, "Joint Sum Rate And Error Probability Optimization: Finite Blocklength Analysis", IEEE Wireless Communications.

Honors and Awards

2023 Khoury College of Computer Sciences Distinguished Postdoctoral Fellowships

2023 Top 8% of reviewers at NeurIPS 2023

2023 Czeslaw and Irene Klawe Scholarship from ECE Department of University of Toronto

2023 Henderson and Bassett Research Fellowship from ECE Department of University of Toronto

2023 Viola Carless Smith Research Fellowship from ECE Department of University of Toronto

2021 Top 8% of reviewers at NeurIPS 2021

2021 Doctoral Completion Award from University of Toronto (15,000 CAD)

2021 Ewing Rae graduate scholarship from ECE Department of University of Toronto

2020–2023 Research grant from the Vector Institute for Artificial Intelligence (36,000 CAD)

2019,2021 MITACS Accelerate Fellowship (42,000 CAD)

2020 Visiting Graduate Student, Institute for Advanced Study, Princeton, New Jersey

2014 Ranked **5th** out of **25,000** in nationwide entrance exams for Master's degree in EE

Invited Talks

Northeastern – Theory Lunch (March 23)

MIT – Tomaso Poggio's Research Group (November 23)

Boston-Area Data Privacy Seminar (October 23)

McMaster University – Department of Computing and Software (June 23)

University of Minnesota – Network and Information Sciences Seminar Series (March 23)

Harvard University – Flavio Calmon's Research Group (March 23)

Google – Privacy in Machine Learning Seminar (December 22)

Google – Information Theory Seminar (September 22)

Canadian Workshop on Information Theory – Ottawa (June 22)

Microsoft Research – Montreal (January 22)

IIMAS, Mexico – Information Theory, Machine Learning and Statistics Seminar (April 21)

Service

Conference Reviewer: ISIT(2019–2023), NeurIPS (2021–2023), ICLR (2022–2024), ICML (2023,2024), COLT (2022,2024), Conference on Secure and Trustworthy Machine Learning (2024).

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

Area Chair: Information-Theoretic Methods for Rigorous, Responsible, and Reliable Machine Learning workshop in ICML 2021. Eastern European Machine Learning Summer School 2022. Conference on Secure and Trustworthy Machine Learning (SaTML) 2024.

Organizer: Boston-Area DP Seminar.

Leadership and Extra-Curricular Activities

Aug. 20–Aug. 23 Executive member of Bahar Charity group at University of Toronto. `https://www.baharcharity.com/`

2020-2023 Mentor at Graduate Application Assistance Program at University of Toronto. `https://sites.google.com/view/torontogaap`

Computer Skills

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

Mathematics: MATLAB (Simulink , CVX), Mathematica, Mathcad, R