Mahdi Haghifam

Curriculum Vitae

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Education

2017-present **Ph.D, University of Toronto**, Toronto, Ontario, Canada, (Expected August 2023).
Electrical and Computer Engineering Department.
Research area: "Information-Theoretic Analysis of Generalization in Machine Learning"
Advisor: Prof. Daniel M. Roy

2014-2016 **M.Sc, Sharif University of Technology**, Tehran, Iran.
Electrical Engineering.
Thesis: "Energy-Efficient Cooperative Data Transmission in the Wireless Communication Networks"
Advisor: Prof. Masoumeh Nasiri-Kenari

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

Publications

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

Journal

1. 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 (Volume: 2, Issue: 4, December 2021).
2. M. Haghifam, V. Y. F. Tan, and A. Khisti, "Sequential Classification with Empirically Observed Statistics", IEEE Transactions on Information Theory (Volume: 67, Issue: 5, May 2021).
3. 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 Letters (Volume: 6, Issue: 6, Dec. 2017).

Conference

1. 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?"
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?" [preprint]
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", International Conference on Algorithmic Learning Theory 34 (ALT), 2023.
4. M. Haghifam, G. K. Dziugaite, S. Moran, D. M. Roy, "Understanding Generalization via Leave-One-Out Conditional Mutual Information", IEEE International Symposium on Information Theory (ISIT), 2022.
5. M. Haghifam, S. Moran, D. M. Roy, G. K. Dziugaite, "Towards a Unified Information–Theoretic Framework for Generalization", Advances in Neural Information Processing Systems 35 (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", Annual Conference on Learning Theory 34 (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", Advances in Neural Information Processing Systems 34 (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", Advances in Neural Information Processing Systems 33 (NeurIPS), 2019.

Workshop

1. M. Haghifam, V. Y. F. Tan, and A. Khisti, "Sequential Classification with Empirically Observed Statistics", IEEE Information Theory Workshop 2019, Visby, Gotland, Sweden.
2. M. Haghifam, A. Badr, A. Khisti, X. Zhu, W. Dan and J. Apostolopoulos, "Streaming Codes with Unequal Error Protection against Burst Losses", The 29th Biennial Symposium on Communications (BSC 2018).
3. M. Haghifam, B. Makki, M. Nasiri-Kenari, T. Svensson, "On joint information and energy transfer in relay networks with an imperfect power amplifier", 27th Annual IEEE International Symposium on Personal, Indoor, and Mobile Radio Communications (PIMRC), Valencia, Spain, 2016.
4. M. Haghifam, M. R. Haghifam, B. Safari Chabook, "State estimation in electric distribution networks in presence of distributed generation using the PMUs", CIRED 2012, Lisbon, Portugal

Honors and Awards

2023 Shahid U.H. Qureshi Memorial Scholarship (4,300 CAD).

2023 Czeslaw and Irene Klawe Scholarship (7,000 CAD).

2023 V. L. Henderson and M. Bassett Research Fellowship (8,200 CAD).

2023 Viola Carless Smith Research Fellowship (9,500 CAD).

2022 North American School of Information Theory Travel Grant.

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 (5,000 CAD).

2020,2021,2002 Research grant from the Vector Institute for Artificial Intelligence (18,000 CAD).

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

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

2019,2021 NeurIPS Travel Grant (500 CAD).

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

Research Experience

Aug. 22–Dec. 22 **Research Intern, Google Brain, California, U.S.**

Mentors: Dr. Thomas Steinke and Dr. Abhradeep Guha Thakurta

Nov. 20–March 21 **Research Intern, Element AI-Service Now, Toronto, Canada.**

Mentor: Dr. Gintare Karolina Dziugaite

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

March 20–Present **Graduate Researcher, Vector Institute for AI, Toronto, Canada.**

Feb. 19–May 19 **Research Intern, Element AI, Toronto, Canada.**

Mentor: Dr. Gintare Karolina Dziugaite

June 15–Sept. 15 **Visiting Researcher, Chalmers University of Technology, Sweden.**

Mentors: Prof. Tommy Svensson, Dr. Behrooz Makki

Invited Talks

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

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

Google – Privacy in Machine Learning (December 22).

Google – Information Theory Reading Group (September 22).

Canadian Workshop on Information Theory (June 22).

Microsoft Research MontrealW (January 22).

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

Service

Conference Reviewer: ISIT(2019-2023). NeurIPS (2021-2023). ICLR (2022,2023). ICML (2023). COLT (2022)

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 (ITR3), workshop in ICML 2021. Eastern European Machine Learning Summer School 2022.

Selected Graduate Courses

Statistical Learning, Online Learning and Sequential Decision Making, Information Theory, Markov Decision Processes, Real Analysis I, Probability Theory I & II, Algorithms for Private Data Analysis.

Computer Skills

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

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

Operating Systems: Windows, Unix, Macintosh