

MOHSEN HEIDARI

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APPOINTMENTS

Assistant Professor Department of Computer Science, Indiana University, Bloomington	Aug. 2022 - Present
Visiting Assistant Professor Department of Computer Science, Purdue University	Aug. 2021 - Aug. 2022
Postdoctoral Research Associate NSF Center for Science of Information (CSoI), Purdue University <i>Host:</i> Wojciech Szpankowski	Aug. 2019 - Aug. 2021
Postdoctoral Research Fellow University of Michigan <i>Host:</i> Sandeep Pradhan	Jan. 2019 - Aug. 2019
Visiting Scholar University of Cambridge <i>Host:</i> Ramji Venkataramanan	Aug. 2018

EDUCATION

Ph.D. Electrical Engineering University of Michigan <i>Advisor:</i> Sandeep Pradhan <i>Thesis:</i> “Capacity, Error Exponent, and Structural Results for Communication Networks”	2013 - 2018
M.Sc., Mathematics University of Michigan	2015 - 2017
M.Sc., Electrical Engineering Sharif University of Technology, Iran	2011 - 2013
B.Sc., Electrical Engineering Sharif University of Technology, Iran	2007 - 2011

HONORS AND AWARDS

- **Google Gift Support for Exploratory Research** 2020, 2021
A sum of \$100,000 research gift for developing classical and quantum learning algorithms, with

Wojciech Szpankowski and Gill Shamir as the PIs.

- **Michigan Cambridge Research Initiative (MCRI) Award** 2018
A total sum of \$11000 + £3000 financial support for joint collaborations with Sandeep Pradhan and Ramji Venkataramanan as the PIs.
- **EECS Outstanding Graduate Student Instructor Award** 2017
University of Michigan,
An annual award to honor top student instructors and aides for their remarkable service and excellence in teaching.
- **German Academic Exchange Service (DAAD) Scholarship** 2017
Awarding international graduate students for experience, as summer internships, at German companies and non-university research institutions at Germany.
- **University of Michigan Rackham Travel Grant** 2015, 2018
- **EECS Department Graduate Fellowship** 2013
University of Michigan,
This fellowship is awarded to new students with outstanding academic background.
- **Ranked 40th** 2007
in Iran's Physics and Mathematics Nation-wide Universities Entrance Exam with more than 125,000 applicants.

RESEARCH CONTRACTS AND GRANTS RECEIVED

- **NSF CCF: Medium** 2022-2026
Learning From Classical and Quantum Data: a Fourier Perspective \$1.2M
Co-PI with Wojciech Szpankowski (PI) and Ananth Grama (Co-PI).

RESEARCH INTERESTS

Quantum Computing and Algorithms, Theoretical Machine Learning, Classical and Quantum Information Theory.

JOURNAL PAPERS

- [J10] M. Heidari, A. Anastasopoulos, S. Pradhan, "On The Reliability Function of Discrete Memoryless Multiple Access Channel with Feedback," in *IEEE Transactions on Information Theory*, 2024, doi: 10.1109/TIT.2024.3484168.
- [J9] C. Wu, M. Heidari, A. Grama, W. Szpankowski, "Expected Worst Case Regret via Stochastic Sequential Covering," in *Transactions on Machine Learning Research*, 2023
- [J8] C. Wu, M. Heidari, A. Grama, W. Szpankowski, "Regret Bounds for Log-loss via Bayesian Algorithms," in *IEEE Transactions on Information Theory*, doi: 10.1109/TIT.2023.3279197.

- [J7] L. Aboulmouna, S. Khanum, M. Heidari, R. Raja, S Gupta, M. R. Maurya, A. Grama, S. Subramaniam, and D. Ramkrishna, “Mathematical Modeling of Eicosanoid Metabolism in Bone-Marrow Derived Macrophage Cells: Cybernetic Framework Combined with Novel Information Theoretic Approaches,” *Processes* 11, no. 3: 874. doi.org/10.3390/pr11030874.
- [J6] M. Heidari, J. Sreeharam, G. Shamir, W. Szpankowski, “Sufficiently Informative and Relevant Features: An Information-theoretic and Fourier-based Characterization,” in *IEEE Transactions on Information Theory*, vol. 68, no. 9, pp. 6063-6077, 2022, doi: 10.1109/TIT.2022.3169998.
- [J5] T. A. Atif, M. Heidari, S. Pradhan, “Faithful Simulation of Distributed Quantum Measurements with Applications in Distributed Rate-Distortion Theory,” in *IEEE Transactions on Information Theory*, pp. 1-34, 2021, doi: 10.1109/TIT.2021.3124976.
- [J4] M. Heidari, S. Pradhan, “Structured Mappings and Conferencing Common Information for Multiple-Access Channels,” in *IEEE Transactions on Information Theory*, vol. 66, no. 7, pp. 4203-4225, 2020, doi: 10.1109/TIT.2020.2980550.
- [J3] M. Heidari, F. Shirani, S. Pradhan, “Quasi Structured Codes for Multi-Terminal Communications,” in *IEEE Transactions on Information Theory*, vol. 65, no. 10, pp. 6263-6289, 2019, doi: 10.1109/TIT.2019. 2930591.
- [J2] R. Kazemi, M. Boloursaz, M.H. Khoozani, F. Behnia, “Modem based on sphere packing techniques in high-dimensional Euclidean sub-space for efficient data over voice communication through mobile voice channels,” *the Institute of Engineering and Technology (IET)*, 2015, pp. 508-516, doi: 10.1049/iet-com. 2014.0610.
- [J1] M.H. Khoozani, F. Marvasti, E. Azghani, M. Ghassemian, “Finding Sub-Optimum Signature Matrices for Overloaded Code Division Multiple Access Systems,” *the Institute of Engineering and Technology (IET) Communications*, 2013, pp. 295-306, doi: 10.1049/iet-com.2012.0208.

CONFERENCE PAPERS

- [C23] M. Heidari, W. Szpankowski, “New Bounds on Quantum Sample Complexity of Measurement Classes,” *IEEE International Symposium on Information Theory Proceedings (ISIT)*, 2024.
- [C22] F. Shirani, M. Heidari, “On Non-Interactive Source Simulation via Fourier Transform,” *Information Theory Workshop (ITW)*, 2023.
- [C21] M. Heidari, W. Szpankowski, “ Learning k -qubit Quantum Operators via Pauli Decomposition,” *Artificial Intelligence and Statistics, (AISTATS)*, 2023.
- [C20] M. Heidari, W. Szpankowski, “Agnostic PAC Learning of k -juntas Using L_2 -Polynomial Regression,” *Artificial Intelligence and Statistics, (AISTATS)*, 2023.
- [C19] C. Wu, M. Heidari, A. Grama, W. Szpankowski, “Precise Regret Bounds for Log-loss via a Truncated Bayesian Algorithm,” *Neural Information Processing Systems (NeurIPS)*, 2022.

- [C18] M. Heidari, A. Anastasopoulos, S. Pradhan, “Upper Bound on the Feedback Error Exponent of Channels with State and Memory,” *IEEE International Symposium on Information Theory Proceedings (ISIT)*, 2022.
- [C17] C. Wu, M. Heidari, A. Grama, W. Szpankowski, “Sequential vs Fixed Design Regrets in Online Learning,” *IEEE International Symposium on Information Theory Proceedings (ISIT)*, 2022.
- [C16] M. Heidari, A. Grama, W. Szpankowski, “Toward Physically Realizable Quantum Neural Networks,” *Association for the Advancement of Artificial Intelligence (AAAI) 2022*, (**15% acceptance rate**).
- [C15] M. Heidari, J. Sreeharam, G. Shamir, W. Szpankowski, “Finding Relevant Information via a Discrete Fourier Expansion,” *International Conference on Machine Learning (ICML)*, 2021, (**21.5% acceptance rate**).
- [C14] M. Heidari, A. Padakandla, W. Szpankowski, “A Theoretical Framework for Learning from Quantum Data,” *IEEE International Symposium on Information Theory Proceedings (ISIT)*, 2021.
- [C13] M. Heidari, J. Sreeharam, G. Shamir, W. Szpankowski, “Information Sufficiency via Fourier Expansion,” *IEEE International Symposium on Information Theory Proceedings (ISIT)*, 2021.
- [C12] M. Heidari, T. Atif, S. Pradhan, “Faithful Simulation of Distributed Quantum Measurements,” *IEEE International Symposium on Information Theory Proceedings (ISIT)*, 2019.
- [C11] M. Heidari, R. Venkataramanan, S. Pradhan, “Boolean Functions with Biased Inputs: Approximation and Noise Sensitivity,” *IEEE International Symposium on Information Theory Proceedings (ISIT)*, 2019.
- [C10] M. Heidari, A. Anastasopoulos, S. Pradhan, “On The Reliability Function of Discrete Memoryless Multiple-Access Channel with Feedback,” *Information Theory Workshop (ITW)*, 2018.
- [C9] M. Heidari, F. Shirani, S. Pradhan, “Bounds on the Effective-length of Optimal Codes for Interference Channel with Feedback,” *IEEE International Symposium on Information Theory Proceedings (ISIT)*, July 2018.
- [C8] M. Heidari, F. Shirani, S. Pradhan, “A New Achievable Rate Region for Multiple Access Channel with States,” *IEEE International Symposium on Information Theory Proceedings (ISIT)*, July 2017.
- [C7] M. Heidari, F. Shirani, S. Pradhan, “On The Necessity of Structured codes for Communications over MAC with Feedback,” *IEEE International Symposium on Information Theory Proceedings (ISIT)*, July 2017.
- [C6] M. Heidari, S. Pradhan, “How to Compute Modulo Prime-Power Sums,” *IEEE International Symposium on Information Theory Proceedings (ISIT)*, Jun 2016.
- [C5] M. Heidari, F. Shirani, S. Pradhan, “New Sufficient Conditions for Multiple-Access Channel with Correlated Sources,” *IEEE International Symposium on Information Theory Proceedings (ISIT)*, Jun 2016.

- [C4] F. Shirani, M. Heidari, S. Pradhan, “Quasi Linear Codes: Application to Point-to-Point and Multi-Terminal Source Coding,” *IEEE International Symposium on Information Theory Proceedings (ISIT)*, Jun 2016.
- [C3] M. Heidari, F. Shirani, S. Pradhan, “Beyond Group Capacity in Multi-terminal Communications,” *IEEE International Symposium on Information Theory Proceedings (ISIT)*, Jun 2015.
- [C2] F. Shirani, M. Heidari, S. Pradhan, “New Lattice Codes For Multiple Descriptions,” *IEEE International Symposium on Information Theory Proceedings (ISIT)*, Jun 2015.
- [C1] M. H. Khoozani, A. Rashidinejad, M.H.L Froushani, P. Pad, F. Marvasti, “Almost-Optimum Signature Matrices in Binary-Input Synchronous Overloaded CDMA,” *18th IEEE Int. Conf. on Telecommunications (ICT)*, May 2011.

NON-REFEREED PUBLICATIONS

- [P2] M. Heidari, S. Pradhan, R. Venkataramanan, “Boolean Functions with Biased Inputs: Approximation and Noise Sensitivity,” *Information Theory and Applications Workshop (ITA)*, Feb. 2019.
- [P1] S. Pradhan, M. Heidari, Aria G. Sahebi, “Corrections to “Abelian Group Codes for Channel Coding and Source Coding”,” *IEEE Transactions on Information Theory*, 2018.

TEACHING EXPERIENCES

Indiana University, Bloomington

- **Instructor**

CSCI B-490, B629: Quantum Computing (Seminar in Computer Science) Spring 2023, '24
 CSCI B-403: Introduction to Algorithm Design and Analysis Fall 2022, '23

REVIEWING SERVICES

- **Conferences:**

ACM Symposium on Theory of Computing (STOC) 2023-
 International Conference on Learning Representations (ICLR) 2023-
 Association for the Advancement of Artificial Intelligence (AAAI) 2022-
 Neural Information Processing Systems (NeurIPS) 2022 -
 International Conference on Machine Learning (ICML) 2022 -
 International Conference on Artificial Intelligence and Statistics (AISTATS) 2021-
 IEEE International Symposium on Information Theory Proceedings (ISIT) 2019-
 Information Theory Workshop (ITW) 2018,'19

- **Journals:**

IEEE Transactions on Information Theory, IEEE Transactions on Communications, Institute of Engineering and Technology (IET) Communications, Mathematical Problems in Engineering

SESSION CHAIR AND ORGANIZING

- **Organizer:** 2022
Workshop on Quantum Algorithms, Information, and Learning, Purdue University
- **Organizer:** 2019
CSoI Seminar Series, Purdue University
- **Co-chair:** 2015
Information Theory and Applications Workshop (ITA), UCSD.

SELECTED INVITED TALKS

- University of Notre Dame Quantum Computing Fall 2022
Learning and Training in Quantum Environment
- AAAI '21 Oral Presentation Summer 2022
Toward Physically Realizable Quantum Neural Networks
- Purdue University, Quantum Computing Workshop Spring 2022
Toward Physically Realizable Quantum Algorithms
- Imperial College London Spring 2021
Learning from Classical and Quantum data: A Fourier Perspective
- Purdue CS Theory Seminar Spring 2021
Learning from Classical and Quantum data: A Fourier Perspective
- CSoI Seminar Series Spring 2020
Feature Selection for Supervised Binary Classification
- University of Main Oct. 2020
Discrete Fourier and Feature Selection
- CSoI Seminar Series Fall 2019
Faithful Simulation of Distributed Quantum Measurements with Applications in Distributed Quantum Computing
- Information Theory and Applications Workshop (ITA) Feb. 2019
Feature Selection and Boolean Function Approximation: An Information Theoretic Approach
- Purdue University Jan. 2019
From Communication to Information Processing: An Information Theoretic Prospective
- Conference on Information Sciences and Systems (CISS) Mar. 2018
Structured Coding Approach to Multiple-Access Channel with Feedback

- ITA Graduation Day Feb. 2018
Coding Structures for Multiple-Access Channel with Feedback
- University of Michigan Data Science Team (MDST) Feb. 2018
Quantum Information Theory
- SPEECS Seminar Series, University of Michigan Jun. 2016
An Introduction to Quantum Information Theory