

MOHSEN HEIDARI

Assistant Professor,
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RESEARCH INTERESTS

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

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

- **NSF Grant CCF:Medium** 2022
A \$1.2M grand for research in quantum learning, Co-PI with Wojciech Szpankowski and Ananth Grama.
- **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.
- **Exceptional Talent Award** Fall 2010
Sharif University of Technology,
Including an honorary admission to M.Sc. program without any entrance exam.
- **Ranked 40th** 2007
in Iran's Physics and Mathematics Nation-wide Universities Entrance Exam with more than 125,000 applicants.

TEACHING EXPERIENCES

Indiana University, Bloomington

- **Instructor** Fall 2022
B-403: Introduction to Algorithm Design and Analysis

University of Michigan

- **Co-Instructor** Winter 2017
EECS 501: Probability and Random Processes
- **Graduate Student Teaching Assistant**
 - EECS 501: Probability and Random Processes (Prof. Pradhan) Fall 2018
 - EECS 501: Probability and Random Processes (Prof. Pradhan) Fall 2017
 - EECS 501: Probability and Random Processes (Prof. Tenenketzeis) Fall 2016

JOURNAL PAPERS

- [J6] M. Heidari, J. Sreeharam, G. Shamir, W. Szpankowski, “Sufficiently Informative and Relevant Features: An Information-theoretic and Fourier-based Characterization,” in *IEEE Transaction 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 Transaction 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

- [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.

INVITED TALKS

- 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
- University at Albany, SUNY 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

REVIEWING SERVICES

- **Journals:**

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

- **Conferences:**

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)	2019-2022
Information Theory Workshop (ITW)	2018,'19
IEEE International Conference on Communications (ICC)	2021
IEEE International Conference on Communications, International Conference on New Technologies, Mobility & Security (NTMS)	2012

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.