

# MOHSEN HEIDARI

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Visiting Assistant Professor,  
Department of Computer Science,  
Purdue University

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## RESEARCH INTERESTS

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

## APPOINTMENTS

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**Visiting Assistant Professor** Aug. 2021 - Present  
Department of Computer Science,  
Purdue University

**Postdoctoral Research Associate** Aug. 2019 - Aug. 2021  
NSF Center for Science of Information (CSoI),  
Purdue University  
*Host:* Wojciech Szpankowski

**Postdoctoral Research Fellow** Jan. 2019 - Aug. 2019  
University of Michigan  
*Host:* Sandeep Pradhan

**Visiting Scholar** Aug. 2018  
University of Cambridge  
*Host:* Ramji Venkataramanan

## EDUCATION

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**Ph.D. Electrical Engineering** 2013 - 2018  
University of Michigan  
*Advisor:* Sandeep Pradhan  
*Thesis:* “Capacity, Error Exponent, and Structural Results for Communication Networks”

**M.Sc., Mathematics** 2015 - 2017  
University of Michigan

**M.Sc., Electrical Engineering** 2011 - 2013  
Sharif University of Technology, Iran

**B.Sc., Electrical Engineering** 2007 - 2011  
Sharif University of Technology, Iran

## HONORS AND AWARDS

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- **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.
- **ITA Graduation Day Talk** 2018  
Selected from the University of Michigan to present recent results at the Information Theory and Application (ITA) workshop, UCSD.
- **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 40<sup>th</sup>** 2007  
in Iran's Physics and Mathematics Nation-wide Universities Entrance Exam with more than 125,000 applicants.
- **Honorable Mention, Khwarizmi Young Festival Award,** 2006  
This award is given annually by the Iranian Research Organization for Science and Technology (IROST) to individuals who have made outstanding achievements in research, innovation and invention, in fields related to science and technology.

## TEACHING EXPERIENCES

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### 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. Teneketzis) Fall 2016

### Sharif University of Technology

- **Teaching Assistant**

Communication Circuits  
Communication Systems  
Analog Circuits

Winter 2012  
Fall 2011  
Fall 2009

## UNDER REVIEW AND WORKING PAPERS

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- [W7] M. Heidari, P. Jacquet, W. Szpankowski, “Regret for Online Regression with Logarithmic Loss for Classical and Quantum Data,” pre-print.
- [W6] Wu, M. Heidari, A. Grama, W. Szpankowski, “Sequential vs Fixed Design Regrets in Online Learning,” pre-print.
- [W5] M. Heidari, A. Anastasopoulos, S. Pradhan, “Upper Bound on the Feedback Error Exponent of Channels with State and Memory,” pre-print.
- [W4] M. Heidari and W. Szpankowski, “Quantum State Classification via Quantum Fourier,” *under review in IEEE Transaction on Information Theory*, available on [arXiv:2102.05209](https://arxiv.org/abs/2102.05209).
- [W3] M. Heidari and W. Szpankowski, “L2-Polynomial Regression is Agnostic PAC Learner for k-Juntas,” *under review*, available on [arXiv:2102.06277](https://arxiv.org/abs/2102.06277).
- [W2] M. Heidari, J. Sreeharam, G. Shamir, W. Szpankowski, “Sufficiently Informative and Relevant Features: An Information-theoretic and Fourier-based Characterization,” *under review in IEEE Transaction on Information Theory*.
- [W1] M. Heidari, A. Anastasopoulos, S. Pradhan, “On The Reliability Function of Discrete Memoryless Multiple Access Channel with Feedback,” *pre-print for IEEE Transaction on Information Theory*.

## JOURNAL PAPERS

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- [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

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- [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

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- [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

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- 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

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- **Journals:**  
IEEE Transactions on Information Theory, IEEE Transactions on Communications, Institute of Engineering and Technology (IET) Communications, Mathematical Problems in Engineering
- **Conferences:**  
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,'20,'21  
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

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