ABOLFAZL HASHEMI

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CURRENT POSITION

Assistant Professor
Purdue University August 2021 – present
Elmore Family School of Electrical and Computer Engineering

- Communications, Networking, Signal and Image Processing (CNSIP)
- Computer Engineering (Artificial Intelligence)

Affiliations

- Director of Machine Intelligence and Networked Data Science Group (MINDS)
- Center for Innovation in Control, Optimization, and Networks (ICON)
- The Center for Education and Research in Information Assurance and Security (CERIAS)

RESEARCH DESCRIPTION

My research interests include:

- Machine Learning
- Signal Processing
- Distributed Learning
- Nonconvex Optimization

The goal of my research is to design socially-responsible collaborative decision-making systems characterized by recourse limitations. In doing so, I design efficient algorithms with mathematical guarantees to render practical deployment of collaborative systems possible in applications within including machine learning, signal processing, optimization, control, and related areas.

EDUCATION

Doctor of Philosophy (Ph.D.), Electrical and Computer Engineering 2016 – 2020
University of Texas at Austin, Austin, Texas, USA
Dissertation: Efficient Algorithms for Structured Inference and Collaborative Learning
Advisor: Prof. Haris Vikalo
Committee: Prof. Alex Dimakis, Prof. Gustavo de Veciana, Prof. Sujay Sanghavi, Prof. Qiang Liu

Master of Science in Engineering (M.S.E.), Electrical and Computer Engineering 2014 – 2016
University of Texas at Austin, Austin, Texas, USA
Advisor: Prof. Haris Vikalo

Bachelor of Science (B.S.), Electrical Engineering 2010 – 2014
Sharif University of Technology, Tehran, Iran
Thesis: Vision-Based Gait Analysis via Exploiting Human Body-Parts Proportion
Advisor: Prof. Babak H. Khalaj

PREVIOUS POSITIONS

Postdoctoral Fellow
University of Texas at Austin 2020 – 2021
Oden Institute for Computational Engineering and Sciences
Advisors: Prof. Inderjit Dhillon, Prof. Rachel Ward, Prof. Ufuk Topcu

Graduate Research Assistant
University of Texas at Austin 2014 – 2020
Department of Electrical and Computer Engineering
Advisor: Prof. Haris Vikalo

Data Scientist Intern
Cognitive Scale, Austin, Texas Summer 2017
Mentor: Dr. Suyog Dutt Jain
Project: Relation extraction for clinical text data using attention-based deep recurrent neural networks

Undergraduate Research Intern
Hong Kong University of Science and Technology Summer 2013
Department of Electrical and Computer Engineering
Host: Prof. Daniel Palomar
Project: Robust estimation of covariance matrices from heavy-tailed distributions

Undergraduate Research Assistant
Sharif University of Technology 2013 – 2014
Department of Electrical Engineering
Advisor: Prof. Babak H. Khalaj
Project: Vision-based gait analysis via exploiting human body-parts proportion

TALKS AS AN INVITED SPEAKER

1. Theory-guided Methods for Private Federated Learning *SIAM Conference on Computational Science and Engineering*, Feb. 2023.
2. Generalization Bounds for Sparse Random Feature Expansions, *SIAM Conference on Mathematics and Data Science (MDS)*, September 2022.
3. On the Convergence of Differentially Private Federated Learning on Non-Lipschitz Objectives via Clipping and Normalized Client Updates, *Federated Learning One World Seminar*, April 2022.
4. AI at Scale: Robustness and Security in Adversarial Environments, *The Center for Education and Research in Information Assurance and Security (CERIAS), Purdue University*, Oct. 2021.
5. Structured and Resource-Constrained Collaborative Learning, *Center for Innovation in Control, Optimization, and Networks (ICON), Purdue University*, Sep. 2021.
6. Structured and Resource-Constrained Collaborative Learning, *Department of Computer Science, Purdue University*, Sep. 2021.
7. Weak Submodular Optimization: Theory, Algorithm, Application, *Department of Computer Science at UIUC*, Feb. 2020.
8. Progressive Stochastic Greedy Sparse Reconstruction and Support Selection, *15th CSL student conference at UIUC*, Feb. 2020.
9. Tutorial on Submodular Maximization, *The Oden Institute for Computational Engineering and Sciences at UT Austin*, Nov. 2019.
10. Tutorial on Submodular Minimization, *The Oden Institute for Computational Engineering and Sciences at UT Austin*, Oct. 2019.
11. Sparse Tensor Decomposition for Haplotype Assembly of Diploids and Polyploids, *12th CSL student conference at UIUC*, Feb. 2017.

PUBLICATIONS

Journal Papers

1. Hashemi*, A., Schaeffer*, H., Shi*, B., Tran*, G., Ward*, R., "Generalization Bounds for Sparse Random Feature Expansions," *Applied and Computational Harmonic Analysis,* 2022.
2. Hashemi, A., Vikalo, H., de Veciana, G., "On the Benefits of Progressively Increasing Sampling Sizes in Stochastic Greedy Weak Submodular Maximization," *IEEE Transactions on Signal Processing,* 2022.
3. Ghasemi, M., Hashemi, A., Vikalo, H., Topcu, U., "Learning in Markov Decision Processes with Varying Rewards: High Probability Regret Bounds under Bandit Feedback and Unknown Horizon," *IEEE Transactions on Automatic Control,* 2022.
4. Hashemi, A., Shafipour, R., Vikalo, H., Mateos, G., "Towards Accelerated Greedy Sampling and Reconstruction of Bandlimited Graph Signals," *Signal Processing,* 2022.
5. Hashemi, A., Acharya*, A., Das*, R., Vikalo, H., Sanghavi, S., Dhillon, I., "On the Benefits of Multiple Gossip Steps in Communication-Constrained Decentralized Federated Learning," *IEEE Transactions on Parallel and Distributed Systems, Special Section on Parallel and Distributed Computing Techniques for AI, ML, and DL,* 2022.
6. Chen, Y., Hashemi, A., Vikalo, H., "Communication-Efficient Variance-Reduced Decentralized Stochastic Optimization over Time-Varying Directed Graphs," *IEEE Transactions on Automatic Control,* 2022.
7. Hashemi, A., Ghasemi, M., Vikalo, H., Topcu, U., "Randomized Greedy Sensor Selection: Leveraging Weak Submodularity," *IEEE Transactions on Automatic Control*, Jan. 2021.
8. Hashemi, A. and Vikalo, H., "Evolutionary Self-Expressive Models for Subspace Clustering," *IEEE Journal of Selected Topics in Signal Processing, Special Issue on Data Science: Robust Subspace Learning and Tracking,* vol. 12, no. 6, pp. 1534–1546, Dec. 2018.
9. Hashemi, A. and Vikalo, H., "Accelerated Orthogonal Least-Squares for Large-Scale Sparse Reconstruction," *Digital Signal Processing,* vol. 82, pp. 91–105, Nov. 2018.
10. Hashemi, A., Zhu, B., Vikalo, H., "Sparse Tensor Decomposition for Haplotype Assembly of Diploids and Polyploids," *BMC Genomics,* vol. 19, no. 4, pp. 1–15, Mar. 2018.

Conference Papers

1. Das, R., Hashemi*, A., Acharya*, A., Sanghavi, S., Dhillon, I., Topcu, U., "Faster Non-Convex Federated Learning via Global and Local Momentum," *Conference on Uncertainty in Artificial Intelligence (UAI),* 2022. **(Acceptance rate: 32.3%)**
2. Acharya, A., Hashemi, A., Jain, P., Sanghavi, S., Dhillon, I., Topcu, U., "Robust SGD via Block coordinate Geometric Median Descent," *International Conference on Artificial Intelligence and Statistics (AISTATS),* 2022. **(Acceptance rate: 29.2%)**
3. Ghasemi*, M., Hashemi*, A., Vikalo, H., Topcu, U., "No-Regret Learning with High-Probability in Adversarial Markov Decision Processes," *Conference on Uncertainty in Artificial Intelligence (UAI),* 2021. **(Acceptance rate: 26.5%)**
4. Ghasemi, M., Hashemi, A., Topcu, U., Vikalo, H., "Online Learning with Implicit Exploration in Episodic Markov Decision Processes," *American Control Conference (ACC),* 2021.
5. Savas, Y., Hashemi, A., Vinod, AP., Sadler, BM., Topcu, U., "Physical-Layer Security via Distributed Beam-forming in the Presence of Adversaries with Unknown Locations," *International Conference on Acoustics, Speech and Signal Processing (ICASSP),* 2021.
6. Chen, Y., Hashemi, A., Vikalo, H., "Decentralized Optimization on Time-Varying Directed Graphs under Communication Constraints," *International Conference on Acoustics, Speech and Signal Processing (ICASSP),* 2021.

7. Hashemi, A. , Vikalo, H., de Veciana, G., "On the Performance-Complexity Tradeoff in Stochastic Greedy Weak Submodular Optimization," *International Conference on Acoustics, Speech and Signal Processing (ICASSP),* 2021.

8. Ghasemi, M., Hashemi, A., Vikalo, H., Topcu, U., "Identifying Low-Dimensional Structures in Markov Chains: A Nonnegative Matrix Factorization Approach," *American Control Conference (ACC),* 2020.

9. Ghasemi*, M., Hashemi*, A., Vikalo, H., Topcu, U., "On Submodularity of Quadratic Observation Selection in Constrained Networked Sensing Systems," *American Control Conference (ACC),* 2019.

10. Shafipour, R., Hashemi, A., Mateos, G., Vikalo, H., "Online Topology Inference from Streaming Stationary Graph Signals," *Data Science Workshop (DSW)*, 2019.

11. Hashemi, A., Ghasemi, M., Vikalo, H., Topcu, U., "Submodular Observation Selection and Information Gathering for Quadratic Models," *International Conference on Machine Learning (ICML)*, June 2019. **(Acceptance rate: 22.6%)**

12. Hashemi, A. and Vikalo, H., "Evolutionary Subspace Clustering: Discovering Structure In Self-expressive Time-series Data," *International Conference on Acoustic, Speech and Signal Processing (ICASSP),* 2019.

13. Consul, S., Hashemi, A., Vikalo, H., "A MAP Framework for Support Recovery of Sparse Signals Using Orthogonal Least Squares," *International Conference on Acoustic, Speech and Signal Processing (ICASSP),* Brighton, 2019.

14. Hashemi*, A., Kilic*, O.F., Vikalo, H., "Near-Optimal Distributed Estimation for a Network of Sensing Units Operating Under Communication Constraints," *Conference on Decision and Control (CDC),* 2018.

15. Hashemi, A., Shafipour, R., Vikalo, H., Mateos, G., "A Novel Scheme for Support Identification and Iterative Sampling of Bandlimited Graph Signals," *Global Conference on Signal and Information Processing (GlobalSIP),* 2018.

16. Hashemi, A., Ghasemi, M., Vikalo, H., Topcu, U., "A Randomized Greedy Algorithm for Near-Optimal Sensor Scheduling in Large-Scale Sensor Networks," *American Control Conference (ACC),* 2018. **(Best student paper award finalist)**

17. Hashemi, A., Shafipour, R., Vikalo, H., Mateos, G., "Sampling and Reconstruction of Graph Signals via Weak Submodularity and Semidefinite Relaxation," *International Conference on Acoustic, Speech and Signal Processing (ICASSP),* 2018.

18. Hashemi, A., Zhu, B., Vikalo, H., "Sparse Tensor Decomposition for Haplotype Assembly of Diploids and Polyploids," *International Workshop on Computational Network Biology: Modeling, Analysis, Control (CNB-MAC),* 2017.

19. Hashemi, A. and Vikalo, H., "Sparse Recovery via Branch and Bound Least-Squares," *International Conference on Acoustic, Speech and Signal Processing (ICASSP),* 2017.

20. Hashemi, A. and Vikalo, H., "Sparse Linear Regression via Generalized Orthogonal Least-Squares," *Global Conference on Signal and Information Processing (GlobalSIP),* 2016.

SCHOLASTIC HONORS

- Top 33% Reviewer of ICML 2020, August 2020
- 1 of 4 selected as an invited student speaker at 15th CSL conference at UIUC, Machine Learning for Signal Processing session, February 2020
- Selected as the Schmidt Science Fellows Award nominee from UT Austin, 2019
- Best student paper award finalist, American Control Conference, June 2018
- 1 of 4 selected as an invited student speaker at 12th CSL conference at UIUC, Bioinformatics and Computational Genomics session, February 2017

- Travel awards for ICML 2019, ACC 2019, ACC 2018, CNB-MAC 2017, ICASSP 2017, GlobalSIP 2016
- Inclusive Classrooms Leadership Certificate, UT Austin, February 2015
- Professional Teaching Assistant Certificate, UT Austin, August 2014
- Qualied as an Exceptional Talent eligible to enter Graduate Studies without entrance exam, Sharif University of Technology, 2013
- Ranked 79th among more than 277,000 participants in the Nationwide University Entrance Exam for B.Sc. degree, 2010
- Recipient of Iranian National Elite Foundation fellowship, 2010-2014

TEACHING EXPERIENCE

Purdue University
Elmore Family School of Electrical and Computer Engineering
Instructor

- ECE 69500: Optimization for Deep Learning — Fall 2022
- Vertically Integrated Projects (VIP), Team RoboMaster — Fall 2022
- ECE 20001: Electrical Engineering Fundamental I — Spring 2022
- ECE 20001: Electrical Engineering Fundamental I — Fall 2021

University of Texas at Austin
Department of Electrical and Computer Engineering
Graduate Teaching Assistant

- Statistical Machine Learning — Fall 2019
- Estimation Theory — Fall 2017
- Digital Signal Processing — Spring 2015
- Digital Signal Processing — Fall 2014

Sharif University of Technology
Department of Electrical Engineering
Undergraduate Teaching Assistant

- Digital Signal Processing — Fall 2013
- Communication Systems — Fall 2013
- Principles of Electronics — Fall 2013
- Principles of Electronics — Spring 2013
- Computer Architecture — Spring 2013
- Logic Circuits — Spring 2013
- Analog Circuits — Spring 2013
- Electromagnetism — Fall 2012

ADVISING

Current Ph.D. Students

- Ege Kaya (since August 2022)
- Mehmet Sahin (since August 2022), Co-adviser: Prof. Behzad Sharif

- Dilek Yalcinkaya (since August 2022), Co-advised with Prof. Behzad Sharif
- Sang Bin Moon (since August 2022)
- Andres C Castillo (since August 2022)
- Zhankun (Zack) Luo, (since August 2022), Co-advised

Current M.Sc. Students

- Antesh U (since December 2021)
- Sravani Ramishetty (since December 2021)

Current B.Sc. Students

- Neha Sherma (since May 2022), Topic: Multi-Robot Control and Navigation
- Dulani Wijayarathne (since March 2022), Topic: Multi-Robot Control and Navigation
- John Stanwick (since October 2021), Topic: Decentralized Finance
- Alexander Zimbalist (since October 2021), Topic: Decentralized Finance

OTHER ADVISING ROLES

Service on M.Sc./Ph.D. Thesis Committees

- Vishnu Chellapandi (Ph.D. student, Purdue)
- Henry Su Wang (Ph.D. student, Purdue)
- Zhan-Lun Chang (Ph.D. student, Purdue)
- Yiuye Chen (Ph.D. student, UT Austin)

Mentees

- Rudrajit Das (Ph.D. student, UT Austin): Communication-efficient and privacy-preserving federated learning, since Summer 2020
- Anish Acharya (Ph.D. student, UT Austin): Robust federated learning and distributed optimization in high dimensions, since Summer 2020
- Yiuye Chen (Ph.D. student, UT Austin): Distributed optimization over resource-constrained networks, since Fall 2019
- Niklas Lauffer (Undergrad, UT Austin): No-Regret Learning in Dynamic Stackelberg Games (now at UC Berkeley), 2021
- Émilie Thomé (Intern at Oden Institute, UT Austin): Communication-efficient multi-task learning and sequential decision making, Spring 2021
- Bobby Shi (Ph.D. student, UT Austin): Sparse random features for function approximation and identification of dynamical systems, 2020
- Hussain Almattar (Visiting undergrad from KAUST, UT Austin): Distributed vs. federated learning: Exploring the trade-offs in collaborative learning schemes, Summer 2019
- Banghua Zhu (Visiting undergrad from Tsinghua, UT Austin): Sparse tensor decomposition for haplotype assembly (now at UC Berkeley), Fall 2017

Other Roles

- Faculty advisor for Purdue RoboMaster Club, since December 2021
- COMPES: Coaching and Mentoring for Purdue ECE Students, since October 2021

- Faculty advisor for Plurimos LLP, since October 2021

SERVICES AT THE PURDUE UNIVERSITY

- Member of the graduate admissions committee, CNSIP and CE areas — December 2021 – present
- Co-organizer of ICON Seminar Series — Spring 2022

PROFESSIONAL MEMBERSHIPS AND SERVICES

Technical Program Committees

- International Conference on Images, Signals, and Computing (ICISC) — 2023
- International Workshop on Signal Processing Advances in Wireless Communications (SPAWC) — 2020
- International Multi-Conference on Computing in the Global Information Technology — 2019
- International Conference on Mobile, Hybrid, and Online Learning — 2019
- International Conference on Advanced Engineering Computing and Applications in Sciences — 2018
- International Multi-Conference on Computing in the Global Information Technology — 2018

Memberships

- Institute of Electrical and Electronics Engineers (IEEE), Signal Processing Society — 2016 – present
- Society for Industrial and Applied Mathematics (SIAM) — 2016 – 2020

Journal Reviews

- IEEE Signal Processing Magazine
- IEEE Transactions on Signal Processing
- IEEE Signal Processing Letters
- IEEE Transactions on Signal and Information Processing over Networks
- Elsevier Signal Processing
- IET Signal Processing
- IEEE Transactions on Robotics
- IEEE Transactions on Control of Networked Systems
- IEEE Transactions on Automatic Control
- Automatica
- IEEE Transactions on Wireless Communications
- IEEE Transactions on Communications
- IEEE Transactions on Cybernetics
- IEEE Journal of Selected Areas in Information Theory
- IEEE Access
- Information Sciences
- SIAM Journal on Scientific Computing
- Nature Scientific Reports
- PLOS One

- Taylor and Francis Journal on Forensic Sciences Research

Conference Reviews

- International Conference on Artificial Intelligence and Statistics (AISTATS) 2021
- International Conference on Machine Learning (ICML) 2020, 2021, 2022
- Conference on Neural Information Processing Systems (NeurIPS) 2020,2022
- American Control Conference (ACC) 2020, 2021, 2022
- International Symposium on Information Theory (ISIT) 2020
- International Workshop on Signal Processing Advances in Wireless Communications (SPAWC) 2020
- Conference on Decision and Control (CDC) 2018
- International Conference on Image Processing (ICIP) 2022

SHORT BIO

Abolfazl Hashemi received the B.Sc. degree in Electrical Engineering from the Sharif University of Technology, Iran, in July 2014, and the M.S.E. and Ph.D. degrees in Electrical and Computer Engineering from the University of Texas at Austin, USA, in May 2016 and August 2020, respectively. From August 2020 to August 2021 he was a Postdoctoral Scholar at the Oden Institute for Computational Engineering and Sciences at the University of Texas at Austin. Since August 2021, he has been an Assistant Professor at the Elmore Family School of Electrical and Computer Engineering at Purdue University. Abolfazl was the 2019 Schmidt Science Fellows Award nominee from UT Austin, and the recipient of the Iranian national elite foundation fellowship and a best student paper award finalist at the 2018 American Control Conference. His research interests include distributed machine learning, optimization, signal processing, and control.

Last Update: 24$^{\text{th}}$ Aug, 2022