Parinaz Naghizadeh

Assistant Professor 238 Baker Systems Integrated Systems Engineering & 1971 Neil Ave Electrical and Computer Engineering Columbus, OH 43210 Ohio State University phone: +1 (614) 247-1638 homepage: parinazn.com e-mail: naghizadeh.1@osu.edu **EDUCATION** Ph.D., Electrical Engineering, University of Michigan August 2016 Advisor: Mingvan Liu Ph.D. thesis: "On the Provision of Public Goods on Networks: Incentives, Exit Equilibrium, and Applications to Cyber Security" M.Sc., Mathematics, University of Michigan May 2014 M.Sc., Electrical Engineering, University of Michigan May 2013 B.Sc., Electrical Engineering, Sharif University of Technology, Iran June 2010 APPOINTMENTS Ohio State University Assistant Professor, Operations Research, Integrated Systems Engineering Sep. 2019 - present Assistant Professor, Electrical and Computer Engineering Sep. 2019 - present Affiliate, Translational Data Analytics Institute Dec. 2019 - present Sep. 2017 - Aug. 2019 Purdue University and Princeton University Edge Lab Postdoctoral Research Associate, College of Engineering Advisor: Mung Chiang University of Michigan Sep. 2016 - Aug. 2017 Postdoctoral Research Fellow, Electrical Engineering and Computer Science Advisor: Mingyan Liu Honors and Awards • NSF CAREER Award 2022 • Ethics Circle Fellow, Center for Ethics and Human Values, Ohio State University 2021 • Rising Stars in EECS, Stanford University 2017 • Finalist for ProQuest Distinguished Dissertation Award, University of Michigan 2016 • Honorable Mention for Richard and Eleanor Towner prize for outstanding Ph.D. research, University of Michigan 2015 • Barbour Scholarship, University of Michigan 2014 - 2015 • Iran's National Elites Foundation Scholarship 2007 - 2010

• Ranked 14th among nearly 350,000 participants in Iran's Physics and Mathematics Nation-wide

2006

2006

• President's Honorary Award at Sharif University of Technology

Universities Entrance Exam

GRANT SUPPORT

- PI. "CAREER: Decision Making, Learning, and Incentive Design in Multilayer Networks" National Science Foundation (NSF), \$550,000.
- PI. "Data Diversity and Debiasing through Exploration and Fairness" Cisco Research, \$120,067.

2022

• OSU PI. "FAI: Fairness in Machine Learning with Human in the Loop" with Yang Liu (UCSC, lead), Mingyan Liu (Michigan), Ming Yin (Purdue) National Science Foundation (NSF) and Amazon, \$240,000 (of \$1M total).

2021 - 2024

RESEARCH KEYWORDS

Network economics; game theory; algorithmic economics; reinforcement learning; economics of cyber security.

PUBLICATIONS

SUBMITTED AND WORKING PAPERS:

- [S1] Y. Liao, P. Naghizadeh. "Social Bias Meets Data Bias: The Impacts of Labeling and Measurement Errors on Fairness Criteria". *Under review*, 2022.
- [S2] Y. Yang, Y. Liu, P. Naghizadeh. "Adaptive Data Debiasing Through Bounded Exploration", arXiv preprint arXiv:2110.13054. *Under review*, 2022.
- [S3] K. Jin, P. Naghizadeh, M. Liu. "Structured Network Games: Leveraging Relational Information in Equilibrium Analysis". *Under review in ACM Transactions on Economics and Computation*.
- [S4] X. Zheng, P. Naghizadeh, A. Yener. "DiPLe: Learning Directed Collaboration Graphs for Peer-to-Peer Personalized Learning". *Under review in ITW'22*.
- [W1] P. S. Oruganti, P. Naghizadeh, Q. Ahmed. "The Impact of Network Design Interventions on the Security of Interdependent Systems". *In preparation (earlier version in CDC'21)*.

JOURNAL PAPERS:

- [J1] M. Abdallah, P. Naghizadeh, A. R. Hota, T. Cason, S. Bagchi, S. Sundaram. "Behavioral and Game-Theoretic Security Investments in Interdependent Systems Modeled by Attack Graphs", IEEE Transactions on Control of Network Systems, 7 (4): 1585-1596, 2020.
- [J2] P. Naghizadeh, M. Liu. "Using Private and Public Assessments in Security Information Sharing Agreements", *IEEE Transactions on Information Forensics and Security*, 15 (1): 1801-1814, 2020.
- [J3] D. Ghavidel, P. Naghizadeh, M. Liu, V. Gupta. "A Reputation-Based Contract for Repeated Crowdsensing with Costly Verification", *IEEE Transactions on Signal Processing*, 67 (23): 6092-6104, 2019.

- [J4] P. Naghizadeh, M. Liu. "Provision of Public Goods on Networks: On Existence, Uniqueness, and Centralities", *IEEE Transactions on Network Science and Engineering*, 5 (3): 225-236, 2018.
- [J5] M. Khalili, P. Naghizadeh, M. Liu. "Designing Cyber Insurance Policies: The Role of Pre-Screening and Security Interdependence". *IEEE Transactions on Information Forensics and Security*, 13 (9): 2226-2239, 2018.
- [J6] P. Naghizadeh, M. Liu. "Opting out of Incentive Mechanisms: A Study of Security as a Non-Excludable Public Good", IEEE Transactions on Information Forensics and Security, 11 (12): 2790-2803, 2016.
- [J7] A. Sarabi, P. Naghizadeh, Y. Liu, M. Liu. "Risky Business: Fine-grained Data Breach Prediction Using Business Profiles", *Journal of Cybersecurity*, 2 (1): 15-28, Oxford University Press, 2016.
- [J8] P. Naghizadeh, M. Liu. "Perceptions and Truth: A Mechanism Design Approach to Crowd-Sourcing Reputation", *IEEE/ACM Transactions on Networking*, 24 (1): 163-176, 2016.

REFEREED CONFERENCE AND WORKSHOP PAPERS:

- [C1] X. Zhang, M. Khalili, K. Jin, P. Naghizadeh, and M. Liu. "Fairness Interventions as (Dis)incentives for Strategic Manipulation". The Thirty-ninth International Conference on Machine Learning (ICML), Jul. 2022.
- [C2] K. Jin, X. Zhang, M. Khalili, P. Naghizadeh, and M. Liu. "Subsidy Mechanisms for Strategic Classification and Regression Problems". *ACM Conference on Economics and Computation (EC'22)*, Jul. 2022.
- [C3] M. Abdallah, D. Woods, P. Naghizadeh, I. Khalil, T. Cason, S. Bagchi, S. Sundaram. "TASHAROK: Using Mechanism Design for Enhancing Security Resource Allocation in Interdependent Systems". IEEE Symposium on Security and Privacy (IEEE S&P), May 2022.
- [C4] Y. Liao, P. Naghizadeh. "The Impacts of Labeling Biases on Fairness Criteria". ICLR Workshop on Socially Responsible Machine Learning, Apr. 2022.
- [C5] K. Jin, X. Zhang, M. Khalili, P. Naghizadeh, and M. Liu. "Incentive Mechanisms in Strategic Learning". *ICLR Workshop on Socially Responsible Machine Learning*, Apr. 2022.
- [C6] P. S. Oruganti, P. Naghizadeh, Q. Ahmed. "The Impact of Network Design Interventions on CPS Security", Control and Decision Conference (CDC), Dec. 2021.
- [C7] M. Abdallah, D. Woods, P. Naghizadeh, I. Khalil, T. Cason, S. Sundaram, S. Bagchi. "Morshed: Guiding Behavioral Decision-Makers towards Better Security Investment in Interdependent Systems", the 16th ACM Asia Conference on Computer and Communications Security (ASIACCS'21), Jun. 2021.
- [C8] P. Naghizadeh, T. Nguyen, S. Vardi. "The Impacts of Prediction Technologies on Relational Contracts", the 30th Workshop on Information Systems and Economics (WISE'19), Dec. 2019.
- [C9] M. Abdallah, P. Naghizadeh, T. Cason, S. Bagchi, S. Sundaram. "Protecting Assets with Heterogeneous Valuations under Behavioral Probability Weighting", Control and Decision Conference (CDC'19), Dec. 2019.

- [C10] P. Naghizadeh, A. Sinha. "Adversarial Contract Design for Private Data Commercialization", ACM Conference on Economics and Computation (EC'19), Jun. 2019.
- [C11] M. Abdallah, P. Naghizadeh, A. R. Hota, T. Cason, S. Bagchi, S. Sundaram. "The Impact of Behavioral Probability Weighting on Security Investments in Interdependent Systems", American Control Conference (ACC'19), Jul. 2019.
- [C12] S. Ahn, M. Gorlatova, P. Naghizadeh, M. Chiang. "Personalized Augmented Reality Via Fog-based Imitation Learning", IEEE Workshop on Fog Computing and the IoT (co-located with IEEE CPS-IoT Week), Apr. 2019.
- [C13] P. Naghizadeh, M. Gorlatova, A. Lan, M. Chiang. "Hurts to Be Too Early: Benefits and Drawbacks of Communication in Multi-Agent Learning", IEEE INFOCOM'19, Apr. 2019.
- [C14] S. Ahn, M. Gorlatova, P. Naghizadeh, M. Chiang, P. Mittal. "Adaptive Fog-Based Output Security for Augmented Reality", ACM SIGCOMM VR/AR Network Workshop, Aug. 2018.
- [C15] P. Naghizadeh, M. Liu. "On the Uniqueness and Stability of Equilibria of Network Games", the 55th Annual Allerton Conference on Communication, Control and Computing (Allerton'17), Oct. 2017.
- [C16] M. Khalili, P. Naghizadeh, M. Liu. "Embracing Risk Dependency in Designing Cyber-Insurance Contracts", the 55th Annual Allerton Conference on Communication, Control and Computing (Allerton'17), Oct. 2017.
- [C17] M. Khalili, P. Naghizadeh, M. Liu. "Designing Cyber Insurance Policies in the Presence of Security Interdependence", the 12th Workshop on the Economics of Networks, Systems and Computation (NetEcon'17), Jun. 2017.
- [C18] D. Ghavidel, P. Naghizadeh, M. Liu, V. Gupta. "A Reputation-Based Contract for Repeated Crowd-sensing with Costly Verification", American Control Conference (ACC'17), May 2017.
- [C19] M. Khalili, P. Naghizadeh, M. Liu. "Designing Cyber Insurance Policies: Mitigating Moral Hazard Through Security Pre-Screening", the 7th International Conference on Game Theory for Networks (GameNets'17), May 2017.
- [C20] P. Naghizadeh, M. Liu. "Exit Equilibrium: Towards Understanding Voluntary Participation in Security Games", IEEE INFOCOM'16, Feb. 2016.
- [C21] P. Naghizadeh, M. Liu. "Inter-Temporal Incentives in Security Information Sharing Agreements", position paper, AAAI Workshop on Artificial Intelligence for Cyber Security (AICS'16), Feb. 2016.
- [C22] P. Naghizadeh, M. Liu. "Provision of Non-Excludable Public Goods on Networks: From Equilibrium to Centrality Measures", the 53rd Annual Allerton Conference on Communication, Control and Computing (Allerton'15), Oct. 2015.
- [C23] Y. Liu, A. Sarabi, J. Zhang, P. Naghizadeh, M. Karir, M. Bailey, M. Liu. "Cloudy with a Chance of Breach: Forecasting Cyber Security Incidents", the 24th USENIX Security Symposium (USENIX'15), Aug. 2015.
- [C24] A. Sarabi, P. Naghizadeh, Y. Liu, M. Liu. "Prioritizing Security Spending: A Quantitative Analysis of Risk Distributions for Different Business Profiles", the 14th Workshop on the Economics of Information Security (WEIS'15), Jun. 2015.

- [C25] P. Naghizadeh, M. Liu. "Budget Balance or Voluntary Participation? Incentivizing Investments in Interdependent Security Games", the 52nd Annual Allerton Conference on Communication, Control and Computing (Allerton'14), Oct. 2014.
- [C26] A. Sarabi, P. Naghizadeh, M. Liu. "Can Less Be More? A Game-Theoretical Analysis of Investment vs. Filtering", the 5th Conference on Decision and Game Theory for Security (GameSec'14), Nov. 2014.
- [C27] P. Naghizadeh, M. Liu. "Voluntary Participation in Cyber-insurance Markets", the 13th Workshop on the Economics of Information Security (WEIS'14), Jun. 2014.
- [C28] P. Naghizadeh, M. Liu. "Establishing Network Reputation via Mechanism Design", the 3rd International Conference on Game Theory for Networks (GameNets'12), May 2012.

Non-refereed Publications and Pre-Prints:

- [P1] P. Naghizadeh, C. Joe-Wong, M. Chiang. "Paid Prioritization with Content Competition", arXiv preprint arXiv:2007.14574, 2020.
- [P2] S. Chaterji, P. Naghizadeh, M.A. Alam, S. Bagchi, M. Chiang, D. Corman, B. Henz, S. Jana, N. Li, S. Mou, M. Oishi, C. Peng, T. Rompf, A. Sabharwal, S. Sundaram, J. Weimer, J. Weller. "Resilient Cyberphysical Systems and their Application Drivers: A Technology Roadmap", arXiv preprint arXiv:2001.00090, 2020.
- [P3] P. Naghizadeh, M. Liu. "Inter-Temporal Incentives in Security Information Sharing Agreements", Information Theory and Applications Workshop (ITA'16), Feb. 2016.
- [P4] P. Naghizadeh, M. Liu. "Closing the Price of Anarchy Gap in the Interdependent Security Game", Information Theory and Applications Workshop (ITA'14), Feb. 2014.
- [P5] P. Naghizadeh, M. Liu. "Incentives, Quality, and Risks: A Look into the NSF Proposal Review Pilot", arXiv preprint arXiv:1307.6528, 2013.

TEACHING EXPERIENCE

Ohio State University

• ECE/ISE 7202: Reinforcement Learning

Autumn 2020 - 2022

New graduate course I developed and taught.

Student evaluation of instruction for Autumn 2020 (as ISE 6194): 5.00/5.

Student evaluation of instruction for Autumn 2021: 4.82/5.

• ISE 7200: Advanced Nonlinear Optimization

Spring 2020 – 2022

Graduate course for first-year Ph.D. and advanced M.Sc. students.

Student evaluation of instruction for Spring 2020: 4.89/5.

Student evaluation of instruction for Spring 2021: 4.78/5.

Student evaluation of instruction for Spring 2022: 5.00/5.

• ISE 4100: Stochastic Modeling and Simulation

Autumn 2020, 2022

Senior-level course on introductory stochastic modeling and discrete-event system simulation. Student evaluation of instruction for Autumn 2020: 4.85/5.

• Guest Lectures

- International Studies 4850: Understanding the Global Information Society Spring 2022 "Fairness, Bias, and other (Ethical) Challenges of Algorithmic Decision Making"

University of Michigan

• EECS 401: Probabilistic Methods in Engineering (Graduate Student Instructor)

Fall 2012

ADVISING EXPERIENCE

CURRENT PH.D. STUDENTS:

• Yifan Yang, ISE	Spring 2020 - present
• Sura Alhanouti, ISE	Autumn 2021 - present
• Pradeep S. Oruganti, ME (co-advised with Qadeer Ahmed)	Autumn 2021 - present
• Amirreza Talebijamalabad, ISE	Spring 2022 - present
• Kevin Chen, ECE (co-advised with Aylin Yener)	Spring 2022 - present

CURRENT M.Sc. AND B.Sc. STUDENTS:

• Altan Torkoglu, M.Sc. ECE	Spring 2022 - present
• Yiqiao Liao, B.Sc. CSE	Summer 2021 - present
• Jiaqi Xu, B.Sc. CSE	Summer 2022 - present

• Katherine Lovelace, B.Sc. Math and African American and African Studies Summer 2022 - present

PAST M.Sc. STUDENTS:

PAST B.Sc. STUDENTS:

• McKenna Hollinger, B.Sc. ECE	Spring 2022
• Adam Wang, B.Sc. ISE	Autumn 2021 - Spring 2022
• Abby Nichter, B.Sc. ECE	Summer 2021 - Spring 2022
• Russell Zhu, B.Sc. CSE,	Summer 2021
• Jessica Griffin, B.Sc./M.Sc. ISE	Summer 2021
• Mingwei Qiu, B.Sc. CSE	Summer 2021

Ph.D. Defense Committee Member:

•	Hao Li, ECE, OSU (Advisors: Wei Zhang and Abhishek Gupta)	2021
•	Mohammad Mahdi Khalili, EECS, University of Michigan (Advisor: Mingyan Liu)	2019

PH.D. CANDIDACY EXAM COMMITTEE MEMBER:

• Linda Capito Ruiz, ECE, OSU (Advisor: Keith Redmill)	2022
• Ferdous Alam, MAE, OSU (Advisor: David Hoelzle)	2021
• Pradeep Sharma Oruganti, MAE, OSU (Advisor: Qadeer Ahmed)	2021
• Shiping Shao, ECE, OSU (Advisor: Abhishek Gupta)	2021
• Jayanth Regatti, ECE, OSU (Advisor: Abhishek Gupta)	2021
• Hao Li, ECE, OSU (Advisors: Wei Zhang and Abhishek Gupta)	2020
• Tong Zhao, MAE, OSU (Advisor: Giorgio Rizzoni)	2020

M.Sc. and B.Sc. Thesis Committee Member:

•	Rachel Hunter-Rinderle, M.Sc., ISE, OSU (Advisor: Ramteen Sioshansi)	2021
•	Tengmu Hu, M.Sc., Math, OSU (Advisor: Chunsheng Ban)	2020
•	Jianzong Pi, B.Sc., ECE, OSU (Advisor: Abhishek Gupta)	2020

INVITED TALKS

- "The Impacts of Labeling and Measurement Errors on Fairness Criteria", Information Theory and Applications Workshop (ITA), UCSD, May. 2022.
- "Social Bias Meets Data Bias: Towards Evaluating and Correcting for the Impacts of Biased Training Data", Institute for Foundations of Data Science (IFDS), Ethics & Algorithm SIG (virtual), Apr. 2022.
- "Social Bias Meets Data Bias: Correcting Biases through Bounded Exploration and Fairness", School of Computing and Information Sciences, Florida International University (virtual), Oct. 2021.
- "Fairness and Bias in Machine Learning", 1st IISE AI Conference, OSU, Nov. 2021.
- "Fairness in Machine Learning: Data Debiasing and Human in the Loop", OSU AI Club, Mar. 2021.
- "The Impacts of Prediction Technologies on Relational Contracts", Information Theory and Applications Workshop (ITA), UCSD, Feb. 2020.
- "Improving Cyber Security through Incentive Design and Data Analytics", Center for Automotive Research, Ohio State University, Feb. 2020.
- "On Information Sharing in Multi-agent Reinforcement Learning", Conference on Edge & Fog on Princeton Edge Lab 10th Anniversary, Princeton University, May 2019.
- "Information and Incentives in Learning and Decision Making on Networks", Department of Electrical, Computer, and Systems Engineering, Rensselaer Polytechnic Institute, Mar. 2019.
- "Information and Incentives in Learning and Decision Making on Networks", Department of Electrical and Computer Engineering, University of Southern California, Mar. 2019.
- "Information and Incentives in Learning and Decision Making on Networks", Department of Integrated Systems Engineering, Ohio State University, Feb. 2019.

- "On Information Sharing in Multi-Agent Reinforcement Learning", Information Theory and Applications Workshop (ITA), UCSD, Feb. 2019.
- "Information and Incentives in Learning and Decision Making on Networks", Department of Industrial and Enterprise Systems Engineering, University of Illinois, Urbana-Champaign, Feb. 2019.
- "Information and Incentives in Learning and Decision Making on Networks", Department of Electrical and Computer Engineering, University of Minnesota, Feb. 2019.
- "Information and Incentives in Learning and Decision Making on Networks", Department of Industrial Engineering and Management Science, Northwestern University, Dec. 2018.
- "On Communication in Multi-agent Reinforcement Learning", INFORMS 2018 Annual Meeting, Advanced Probability Invited Session, Nov. 2018.
- "Network Games with Applications in Cyber Security", Purdue CS Theory Seminar, Apr. 2018.
- "Adversarial Contract Design for Selling Data", Information Theory and Applications Workshop (ITA), UCSD, Feb. 2018.
- "Network Games with Applications in Cyber Security", Purdue ECE Seminar, Dec. 2017.
- "Decision Making and Crowdsourcing on Networks", EDGE lab, Princeton University, May 2017.
- "Improving Cyber Security through Cyber Insurance and Data Analytics", Electrical Engineering Department, Texas A&M University, Apr. 2017.
- "Incentivizing Improved Cyber Security: A Study of Security as a Public Good", Computer Engineering and Systems Group Remote Seminar, Texas A&M University, Mar. 2017.
- "Network Structures and Public Good Provision Games", Information Theory and Applications Workshop (ITA), UCSD, Feb. 2017.
- "Security Pre-Screening in the Design of Cyber-Insurance Policies", CSP Seminar, Department of Electrical Engineering, University of Michigan, Jan. 2017.
- "Incentivizing Improved Cybersecurity: A Study of Security as a Public Good", Department of Electrical Engineering, University of California San Diego, Nov. 2016.
- "On the Provision of Public Goods on Networks", Communications, Networks, and Systems Seminar, Ming Hsieh Institute, University of Southern California, Nov. 2016.
- "Provision of Public Goods on Networks and its Applications to Cyber-Security", *University of Notre Dame*, Sep. 2016.
- "Provision of Non-Excludable Public Goods on Networks: Incentives, Exit Equilibrium, and Applications to Cyber Security", ITA Graduation Day, UCSD, Feb. 2016.

SERVICE AND PROFESSIONAL ACTIVITIES

CONFERENCE ORGANIZATION:

• Submission and Publication Co-Chair, ACM MobiHoc

TECHNICAL PROGRAM COMMITTEE MEMBER:

• ACM Conference on Fairness, Accountability, and Transparency (ACM FAccT)	2022
• IEEE International Symposium on Information Theory (ISIT)	2022
• ACM International Symposium on Theory, Algorithmic Foundations, and Protocol Design for Mobile Networks and Mobile Computing (ACM MobiHoc)	2019 - 2022
• International Symposium on Modeling and Optimization in Mobile, Ad Hoc and Wireless Networks (WiOpt)	2019 - 2022
• Conference on Decision and Game Theory for Security (GameSec)	2021 - 2022
\bullet ICML/ICLR workshop on Socially Responsible Machine Learning	2021 - 2022
• IEEE Sarnoff Symposium	2019
\bullet IEEE/IFIP Conference on Dependable and Secure Networks (DSN) Fast Abstract	2019
• ACM International Conference on emerging Networking EXperiments and Technologie	
(CoNEXT) Student Workshop	2019

PANEL MEMBER FOR GRANT PROPOSAL REVIEW:

National Science Foundation (NSF), CISE, CCF	2022
National Science Foundation (NSF), CISE, CNS	2021

EXTERNAL REVIEWER FOR JOURNALS AND CONFERENCES:

Journals: (each listed only once) IEEE Transactions on Control of Network Systems, IEEE Transactions on Automatic Control, IEEE/ACM Transactions on Networking, IEEE Transactions on Communications, IEEE Transactions on Information Theory, IEEE Transactions on Information Forensics & Security, IEEE Transactions on Neural Networks and Learning Systems, IEEE Transactions on Mobile Computing, IEEE Transactions on Dependable and Secure Computing, IEEE Transactions on Vehicular Technology, IEEE Transactions on Cognitive Communications & Networking, IEEE Security & Privacy, IEEE Networking Letter, IEEE JSAC Special issue on Smart Data Pricing for Next Generation Networks, IEEE JSAC Series on Machine Learning for Communications and Networks, ACM Transactions on Internet Technology, Computer, Information Technology and People, Physica A, International Journal on Robust and Nonlinear Control, Elsevier Computers & Industrial Engineering.

Conferences: CDC, ACC, GlobalSIP, ICC, VTC, SODA, NeurIPS, AISTATS.

DEPARTMENTAL SERVICE AT OSU:

•	OR Faculty Search Committee (ISE)	2021 -	2022
•	Chair's Advisory Committee (ISE)	2020 -	2022

OUTREACH, VOLUNTEERING, AND OTHER SERVICE:

• Faculty advisor, IISE student chapter, Ohio State University	2022 -
• Judge, Denman Undergraduate Research Forum, Ohio State University	2022

•	Volunteer, Data Science for Women Summer Camp, TDAI, Ohio State University	2021
•	Judge, MakeOHI/O Makeathon, Ohio State University	2021
•	Judge , Summer Undergraduate Research Fellowship (SURF) Program, Purdue University	2018
•	Organizing member, networking events and social gatherings for graduate women in	
	Electrical Engineering and Computer Science, University of Michigan 2013	- 2015

PROFESSIONAL MEMBERSHIPS: IEEE, INFORMS.