Amir Ghasemian

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Research Interests

I am interested in analysis and modeling of complex systems and social networks using probabilistic graphical models, causal inference techniques, statistical physics, information theory, machine learning approaches, signal processing, optimization, and linear algebra. My experience includes network science, statistical inference, causal inference on networks, method and data analysis using statistical physics, community detection, and link prediction.

Academic Positions

Research Scientist, 2024-present
Computational Social Science Lab, University of Pennsylvania
Supervisor: Duncan Watts

Affiliated researcher at Human Nature Lab, 2024-present
Yale University

CIFellow 2020, 2021-2023
Human Nature Lab, Yale University
Supervisor: Nicholas Christakis

Affiliated researcher at Computational Social Science Lab, 2020-2023
University of Pennsylvania

Postdoctoral Research Fellow, 2019-2020
Department of Statistics at Harvard/Temple University
Supervisor: Edoardo Airoldi

Visiting Scholar at ISI (USC), working with Aram Galstyan 2017-2018

Visiting Scholar at Santa Fe Institute, working with Cristopher Moore 2018

Education

PhD, Computer Science, University of Colorado Boulder 2014-2018
Supervisor: Aaron Clauset,
Thesis: Limits of model selection, link prediction, and community detection

Master of Science, Signal Processing and Communication Systems 2012-2014
University of Colorado Boulder

Google Scholar https://scholar.google.com/AmirGhasemian

Manuscripts in Preparation (⅄)

- **A. Ghasemian,** and N. Christakis, “Cooperation in Real Human Networks.”
- **A. Ghasemian,** and N. Christakis, “The Balance Theory and the Null Models.”
- **A. Ghasemian,** A. Clauset, and C. Moore, “Optimal Algorithms for Community Detection in Dynamic Networks with Link Persistency.”
- **A. Ghasemian,** “Link Prediction Methods, a Taxonomy of Distribution of Information.”
- **A. Ghasemian**, “Link Prediction Cheat Sheet.”
- **A. Ghasemian,** “Network Structure in Cooperative Games.”

- ⅄ H. Hosseinmardi, **A. Ghasemian**, J. Ludan, and D. J. Watts, "Weakly Supervised Labeling for Rare Topics."
- ⅄ M. Zhang, **A. Ghasemian,** and E. Airoldi, "Optimal Treatment Assignments for Model-Assisted Randomized Experiment Design in Bipartite Networks."
- ⅄ H. Hosseinmardi, **A. Ghasemian,** and D. J. Watts, "Stacking Topic Models."

Under Review (δ)

- δ X. He, **A. Ghasemian,** E. Lee, A. Clauset, and P. Mucha, "Link Prediction Accuracy on Real-World Networks Under Non-Uniform Missing Edge Patterns." (2024) – Available to share upon request.
- δ **A. Ghasemian,** M. Zhang, and E. Airoldi, "Theoretical Insights and New Algorithms for Model-Assisted Design of Experiments under Network Correlated Outcomes." (2023) – Available to share upon request.
- δ **A. Ghasemian,** and N. Christakis, "The Structure and Some Functions of Antagonistic Ties in Village Social Networks." (2023) – Available to share upon request.

Peer-Reviewed Publications (∞)

- ∞ X. He, **A. Ghasemian,** E. Lee, A. Clauset, and P. Mucha, "Sequential Stacking Link Prediction Algorithms for Temporal Networks." *Nat. Commun.* (Forthcoming) (preprint: link) (2024)
- ∞ H. Hosseinmardi, **A. Ghasemian**, M. Rivera-Lanasa, M. Ribeiro, R. West, D. J. Watts, "Causally Estimating the Effect of YouTube's Recommender System Using Counterfactual Bots," *Proc. Natl. Acad. Sci. USA* (Forthcoming) (arXiv: 2308.10398) (2024).
- ∞ **A. Ghasemian,** and N. Christakis, "The Enmity Paradox," *Sci Rep,* 13, 20040 (2023). (arXiv: 2304.10076).
- ∞ H. Hosseinmardi, **A. Ghasemian**, K. Lerman, and E. Ferrara, "Tensor Embedding: A Supervised Framework for Human Behavioral Data Mining and Prediction." *2023 IEEE 11th International Conference on Healthcare Informatics (ICHI). IEEE, 2023*. (arXiv: 1808.10867).
- ∞ **A. Ghasemian**, A. Olfat, and M. Amiri, "Subspace Based DOA Estimation of DS-CDMA Signals," *Telecommun Syst*, 83, 17–28 (2023).
- ∞ H. Hosseinmardi, **A. Ghasemian,** A. Clauset, D. Rothschild, D. Watts, "Examining the Consumption of Radical Content on YouTube," *Proc. Natl. Acad. Sci. USA* **118**(32), e2101967118 (2021).
- ∞ **A. Ghasemian,** H. Hosseinmardi, A. Galstyan, E. Airoldi, and A. Clauset, "Stacking Models for Nearly Optimal Link Prediction in Complex Networks," *Proc. Natl. Acad. Sci. USA* **117**(38), 23393-23400 (2020). (arXiv: 1909.07578).
- ∞ **A. Ghasemian**, H. Hosseinmardi, and A. Clauset, "Evaluating Overfit and Underfit in Models of Network Community Structure," *IEEE Trans. Knowledge and Data Engineering* **32**(9), 1722-1735 (2019). (arXiv: 1802.10582).
- ∞ **A. Ghasemian**, P. Zhang, A. Clauset, C. Moore, and L. Peel, "Detectability Thresholds and Optimal Algorithms for Community Structure in Dynamic Networks," *Physical Review X* **6**, 031005 (2016). (arxiv: 1506.06179).
- ∞ H. Hosseinmardi, **A. Ghasemian**, R. Han, Q. Lv, and S. Mishra, "Towards Understanding Cyberbullying Behavior in a Semi-Anonymous Social Network," *Proc. 2014 IEEE/ACM International Conference on Advances in Social Network Analysis and Mining* (ASONAM), 244-252 (2014). (arxiv: 1404.3839).

Workshop Papers (○)

- ○ **A. Ghasemian**, A. Galstyan, and A. Clauset, "Highly Accurate Link Prediction in Networks Using Stacked Generalization," *Proc. of the 1st International Workshop on Heterogeneous Networks Analysis and Mining (HeteroNAM),* (2018).

Awards (Y)

Research Funding

- Y $262K award from Computing Innovation Fellowship from Computing Research Association (CRA) and National Science Foundation (NSF), 2021–2022. "Sample size calculation and power analysis in network-based experiments" [Link].
- Y $80K extended award from Computing Innovation Fellowship from Computing Research Association (CRA) and National Science Foundation (NSF), 2023. "Sample size calculation and power analysis in network-based experiments" [Link].

Research Awards

- Y Ranked 1st, in M.S., Communications group, ECE Department, University of Tehran.
- Y Awarded as Top Student in B.S., ECE Department.

Teaching (Ⅱ)

Guest lecturer

- Ⅱ Limits of model selection and link prediction, Verification and Validation of Models (CSI 709/CSS 739), George Mason University, Fall 2020.

Teaching Assistant, School of Computer Science, and School of Electrical and Computer Engineering, University of Colorado-Boulder

- Ⅱ Algorithms, Spring 2014 (120 students).
- Ⅱ Application of Embedded Systems, Fall 2013 (60 students).
- Ⅱ Circuit Laboratory, Fall 2012, Spring 2013 (50 students).
- Ⅱ Introduction to Digital Filtering, Spring 2012 (21 students).

Mentoring (☼)

☼ Omkar Bajaj, BS Computer Science, University of Texas at Austin,	Aug 2023
☼ Amirhossein Sarkaboudi, BS Physics, Shahid Beheshti University,	May 2023 – Aug 2023
☼ Xie He, PhD Applied Math, Dartmouth University (co-mentored with Peter Mucha),	Aug 2020 – present
☼ Minzhengxiong Zhang, PhD Statistics, Temple University (co-mentored with Edo Airoldi),	Feb 2019 – present
☼ Alice Lu, MS Public Health, Yale University (co-mentored with Ana L. Rodriguez),	Feb 2022 – May 2023
☼ R Brandi Richardson, BS Cognitive Science, Yale University (co-mentored with Ana L. Rodriguez),	Feb 2022 – Aug 2022
☼ R Elizabeth Hopkinson, BS Environmental Studies, Yale University (co-mentored with Ana L. Rodriguez),	Sep 2022 – Dec 2022
☼ R Karina Raygoza Cortez, MPH Chronic Disease Epidemiology, Yale University (co-mentored with Ana L. Rodriguez),	Sep 2022 – May 2023

Talks and Poster (▪)

Invited talks

"Optimal Algorithms for Community Detection in Dynamic Networks with Edge Persistency,"

- Minisymposium Community detection and seriation for complex networks at SIAM MDS20, June 25th, 2020.

"Evaluating Overfit and Underfit in Models of Network Community Structure,"

- Modeling and Mining Network Data, SIAM Data Mining Minisymposium, Denver, CO, June 7th, 2018,
- Bioinformatics Supergroup, Boulder, CO, April 30th, 2018.

"Detectability Thresholds and Optimal Algorithms for Community Structure in Dynamic Networks, Clustering of Graphs: Theory and Practice,"

- AMS Sectional Meeting program, Washington State University in Pullman, WA on April 22-23, 2017,

- SFI Workshop, Santa Fe, December 2015.

Conference Talks

"The Enmity Paradox,"

- NetSci, Vienna, Austria, July 14th, 2023.

"Restricted Randomizations and Approximate Marginal MSE in the Presence of Homophily,"

- networks2021, July 6th, 2021,
- NetSci satellite (SINM), virtual meeting, Sep 20th, 2020.

"Optimal Algorithms for Community Detection in Dynamic Networks with Edge Persistency,"

- JSM, August 3rd, 2020,
- NetSci satellite (SINM), Burlington, May 27th, 2019.

"Stacking Models for Nearly Optimal Link Prediction in Complex Networks,"

- 1st Annual Meeting for The Northern States Section of SIAM, University of Wyoming, Laramie, WY, Sep 2019,
- IMS NRC, Fort Collins, July 2019; NetSci, Burlington, May 29th, 2019.

"Evaluating Overfit and Underfit in Models of Network Community Structure,"

- IC2S2, Chicago, MA, July 13th, 2018,
- COMPLENET, Boston, MA, March 8th, 2018.

"Highly Accurate Link Prediction in Networks Using Stacked Generalization,"

- HeteroNAM, Los Angeles, CA, Feb 9th, 2018.

Poster

"The Enmity Paradox,"

- IC2S2, July 18th, 2023 [Link].

"Restricted Randomizations to Reduce the Variance of Causal Inference Estimator in Network-based Experiments,"

- NITRD 30th Anniversary Symposium, May 25th, 2022 [Link].

Other Experiences (α)

α Analysis of the mobility data of Covid-19 for the City of Philadelphia: Optimal Interventions to Control COVID-19 in Networked Populations, J. F. Barreras, V. Preciado, H. Hassani, D. J. Watts, H. Hosseinmardi, A. Ghasemian, M. Whiting. (2020)

α Frustrated and Disordered Systems, Boulder Summer School 2017.

Professional Services ★★☆ (ψ)

Ψ Journal reviews: PNAS, Science Advances, Physical Review Letters, Physical Review X, Physical Review E, IEEE Transactions on Signal Processing, IEEE Transactions on Network Science and Engineering, Scientific Reports, Journal of Complex Networks, Network Science Journal.

Ψ Conference reviews: IC2S2 2024 (tutorial committee), WWW 2024 (program committee), NetSci 2023 (program committee), NetSci 2022, NeurIPS 2020 (program committee), NeurIPS 2019, NetSci 2018, WWW 2018, HeteroNAM 2018 (program committee), WSDM 2016, ICWSM 2016.