

# Arnab Kumar Sarker

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**EDUCATION**      **Massachusetts Institute of Technology**, Cambridge, MA      Sep 2019 - Present  
PhD. Candidate in Social and Engineering Systems and Statistics  
Advisor: Ali Jadbabaie,      Committee: Sinan Aral, Dean Eckles, Devavrat Shah  
**GPA: 5.00/5.00**

**University of Pennsylvania**, Philadelphia, PA  
M.S.E., Data Science      Aug 2017 - May 2019  
B.S.E., Networked and Social Systems Engineering      Aug 2015 - May 2019  
**GPA: 4.00/4.00**

**RESEARCH INTERESTS**      Network Science, Computational and Mathematical Statistics, Social Capital, Algebraic Topology

**JOURNAL PUBLICATIONS**      **Sarker, A.**, Northrup, N., and Jadbabaie, A. (2024). “Higher-order homophily on simplicial complexes.” *Proceedings of the National Academy of Sciences*.

**Sarker, A.**, Jadbabaie, A., and Shah, D. (2024). “Unifying epidemic models with mixtures.” *IEEE Transactions on Signal and Information Processing over Networks*.

Jadbabaie, A.\*, **Sarker, A.\***, and Shah, D.\* (2023). “Implicit feedback policies for COVID-19: why ‘zero-COVID’ policies remain elusive.” *Nature Scientific Reports*.  
(\* = Equal Contribution)

**Sarker, A.**, Fisher, P., Gaudio, J. E., and Annaswamy, A. M. (2023). “Accurate parameter estimation for safety-critical systems with unmodeled dynamics.” *Artificial Intelligence*.

Cramer, E., Huang, Y., Ray, E., [et al., including **Sarker, A.** as a part of the US COVID-19 Forecast Hub Consortium]. (2022). “The United States COVID-19 Forecast Hub dataset.” *Nature Scientific Data*.

Cramer, E., Ray, E., Lopez, V., [et al., including **Sarker, A.**]. (2022). “Evaluation of individual and ensemble probabilistic forecasts of COVID-19 mortality in the United States.” *Proceedings of the National Academy of Sciences*.

**CONFERENCE/WORKSHOP PAPERS**      **Sarker, A.** and Park, P. (2024). “Co-Present Triads.” *International School and Conference on Network Science (NetSci-X)*.

Wu, X., **Sarker, A.**, and Jadbabaie, A. (2022). “Link Partitioning on Simplicial Complexes Using Higher-Order Laplacians.” *Proceedings of the 22nd IEEE International Conference on Data Mining*

**Sarker, A.**, Northrup, N., and Jadbabaie, A. (2022). “Generalizing Homophily to Simplicial Complexes.” *Proceedings of the 11th International Conference on Complex Networks and their Applications*.

**Sarker, A.**, Jadbabaie, A., and Shah, D. (2021). “Mixtures Matter: Interpretable Forecasting for Epidemics.” *Tenth International Conference on Learning Representations (ICLR) Workshop on AI for Public Health*.

**WORKING/  
SUBMITTED  
PAPERS**

Available manuscript drafts may be found at [arnabs.mit.edu/research](http://arnabs.mit.edu/research)

**Sarker, A.**, Seby, J. B., Benson, A. R., and Jadbabaie, A. (2023). “Which Bridges Are Weak Ties? Algebraic Topological Insights on Network Structure and Tie Strength.” *arXiv preprint arXiv:2108.02091*. Journal Article Under Review.

Malani, A., Soman, S., Asher, S., [et al., including **Sarker, A.**]. (2020). “Adaptive control of COVID-19 outbreaks in India: Local, gradual, and trigger-based exit paths from lockdown.” *National Bureau of Economic Research*. Working paper on hold.

**TEACHING  
EXPERIENCE**

**Instructor, Massachusetts Institute of Technology**

Learning of Time Series with Interventions (MIT EdX) Winter 2023

Social and Engineering Systems Microeconomics Camp Summer 2021 – 2023

**Guest Lecturer, Massachusetts Institute of Technology**

Solved with AI (4.S23) Spring 2023

*Guest Lecture on Fundamentals of Network Science*

**Teaching Assistant, Massachusetts Institute of Technology**

Marketing and Product Analytics (15.819) Spring 2024

*Instructor:* Dean Eckles

Learning of Time Series with Interventions (IDS.S24/6.S899) Fall 2022

*Instructors:* Munther Dahleh, Devavrat Shah, Mardavij Roozbehani

Introduction to Network Models (1.022) Fall 2020

*Instructor:* Amir Ajorlou

**Teaching Assistant, University of Pennsylvania**

Seven courses, ranging from 25-300 students.

**ADDITIONAL  
RESEARCH  
EXPERIENCE**

**Research Collaboration with Liberty Mutual Group**

Analyze network data associated with surety contracts to augment existing risk measures; report data-driven insights to key stakeholders.

**GerryFair: Auditing and Learning for Subgroup Fairness**

Senior Design Project Advised by Michael Kearns and Aaron Roth

**A Unified Framework for Quantile Elicitation with Applications**

Master’s Thesis Advised by Arpit Agarwal and Shivani Agarwal

**PROFESSIONAL  
EXPERIENCE**

**Apple, Inc.**, Sacramento, CA Summer 2019

Strategic Data Solutions Intern

- Developed an extensible and efficient system for visualization and analysis of large amounts of manufacturing data, greatly reducing overhead for product development.

**Quantedge Capital, LLC**, New York, NY Summer 2018

Quantitative Research Intern

- Reviewed literature in economic theory to understand the use of different securities in financial settings; cross-validated results of each study using recent financial data.

**Audible, Inc.**, Cambridge, MA Summer 2017

Software Engineering Intern

- Designed database and visualization software for quality assurance engineers to access test results from heterogeneous sources in one centralized application.

## TALKS

### **Algebraic Topology for Social Network Analysis**

- Morgan Stanley Machine Learning Research Seminar Series, January 2024

### **Co-Present Triads**

- International School and Conference on Network Science (NetSci-X), January 2024

### **Which Bridges are Weak Ties? Algebraic Topological Insights on Network Structure and Tie Strength**

- NSF Conference on Network Science and Economics, March 2023

### **Generalizing Homophily to Simplicial Complexes**

- 11th International Conference on Complex Networks and their Applications, November 2022

### **Determining Influential Edges with Higher Order Information**

- LIDS and Stats Tea Talk, November 2021

### **Input Dependent Estimation Bounds for Controllable Linear Systems**

- IDSS Student Seminar, May 2020

### **Random Walks on Edges and Personalized Edge PageRank**

- IDSS Student Seminar, March 2020

## SERVICE

**Conference/Workshop Organization:** Program Committee, Mind Meets Media Workshop at IEEE International Conference on Data Mining, December 2023. Student Organization Committee, Paths from Research to Impact Workshop, April 2021. Moderator, Learning for Dynamics and Control Conference, June 2021

**Technical Reviewer:** IEEE Conference on Decision and Control, IEEE American Control Conference, International Conference on Machine Learning (ICML), Nature Communication Physics, Machine Learning (MACH), International Conference on Learning Representation (ICLR)

## HONORS AND AWARDS

**Michael Hammer Fellow** Fall 2019 - Spring 2020

**John Grist Brainerd Award** Spring 2019

**Engineering Alumni Society E. Stuart Eichart, Jr. Award** Spring 2018

**Tau Beta Pi** Fall 2017 - Present

## LEADERSHIP

**President**, Eta Kappa Nu Honor Society Spring 2017 - Spring 2018  
*Other Role:* Service Director Spring 2018 - Spring 2019

**President**, Alpha Sigma Phi Fraternity Fall 2017 - Fall 2018  
*Other Roles:* Treasurer, Scholarship Director Fall 2016 - Fall 2017

**Volunteer**, Symphony for a Broken Orchestra Fall 2017

## REFERENCES

**Professor Ali Jadbabaie**  
JR East Professor of Engineering  
Head, Department of Civil and  
Environmental Engineering  
Massachusetts Institute of Technology  
Email: jadbabai@mit.edu

**Professor Devavrat Shah**  
Andrew (1956) and Erna Viterbi Professor  
Department of Electrical Engineering and  
Computer Science  
Massachusetts Institute of Technology  
Email: devavrat@mit.edu

**Professor Patrick Park**  
Assistant Professor  
Institute for Software Research, School  
of Computer Science  
Carnegie Mellon University  
Email: patpark@cmu.edu