

MANSI SOOD

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Research Interests: Network Science, Privacy, Optimization, and Machine learning

EDUCATION

Carnegie Mellon University, Pittsburgh, USA

Aug '18 - ongoing

PhD Candidate (GPA 4.0/4.0), Electrical and Computer Engineering and Cylab Security and Privacy Institute

Advisor: Osman Yağan

Indian Institute of Technology Bombay, Mumbai, India

Jul '13 - Jun '18

B.Tech & M.Tech in Electrical Engineering; Minor in Design, Industrial Design Centre

Advisors: Sharayu Moharir and Ankur Kulkarni

SELECTED AWARDS AND HONORS

- **Best Paper Award**, IEEE International Conference on Communications (ICC). '21
- **MIT Rising Stars in EECS**. '21
- **Dowd Fellowship** (Awarded to **top 3** applicants in the College of Engineering), CMU. '20
- **Unsung Hero Award** for contributions to Diversity, Equity, and Inclusion, CMU. '22
- **Presidential Fellowship**, CyLab Security & Privacy Institute, CMU. '20
- Invited to visit the **Institute for Advanced Study**, Princeton, for the Mathematics of Machine Learning Program. '22
- **Advanced Graduate Ambassadorship**, Institute for Advanced Study Women and Mathematics Program. '22
- **Lee-Stanziale Ohana Endowed Fellowship**, CMU ECE. '22
- **Knight Fellowship**, Center for Informed Democracy and Social-cybersecurity, CMU. '20, '22
- **David H. Barakat & LaVerne Owen-Barakat CIT Dean's Fellowship**, CMU. '19
- **Excellence in Research and Mentorship**, IIT Bombay. '18
- **Excellence in Teaching Assistantship**, IIT Bombay. '18
- **All India Rank 6** amongst **1.1** Million students (**1st** amongst women) in All India Engineering Entrance Examination. '12

RESEARCH EXPERIENCE

Network Design for Secure, Decentralized Communication and Computations, CMU

Aug '18 - ongoing

Mentor: O. Yağan, CMU ECE & Cylab

- Proposed and analyzed models for constructing *sparse*, distributed networks with formal *connectivity* guarantees.
- Demonstrated improvement in connectivity and robustness over classical models like Erdős-Rényi graphs.
- Evaluating applications for *privacy-preserving* distributed computations.
- *Resulted in 5 refereed conference publications, 3 journal submissions, and the Best Paper Award at ICC 2021.*

Machine Learning Research Intern, Bosch Center for Artificial Intelligence, USA

Jun '22 - Aug '22

Mentors: W. S. Lin and I. Batalov, Robust & Safe Deep Learning Group

- Evaluated sensor fusion and one-class classification techniques to detect tampering in EBike sensing systems.
- Implemented novel algorithms leveraging *multimodal robustness* to develop a physics-informed classifier.

Heterogeneous Network Models for Controlling Spreading Phenomena, CMU

Sep '20 - ongoing

Mentors: C. W. Wu, IBM TJ Watson Research Center; H. V. Poor, S. A. Levin, Princeton University; O. Yağan, CMU

- Formulated models to delineate risk factors for *mutations* in pathogens under different contact patterns.
- Derived the key epidemiological metrics for mutating contagions on clustered, multi-layer networks.
- *Led to a 2+ years long interdisciplinary research collaboration with IBM Research Center and Princeton University.*

Masters Thesis: Game Theory and Optimal Pricing in Crowdsourcing, IIT Bombay

Jan '17 - Jul '18

Mentors: Sharayu Moharir and Ankur Kulkarni, IIT Bombay

- Modeled platform *competition* and analyzed optimal pricing strategies under unknown supply/demand.
- *Resulted in 3 publications and the Excellence in Research Award at IIT Bombay.*

SELECTED PUBLICATIONS

On the Minimum Node Degree and k -connectivity in Inhomogeneous Random K -out Graphs

M. Sood, O. Yağan,
IEEE Transactions on Information Theory, 2021.

Tight Bounds for Connectivity of Random K -out Graphs

M. Sood, O. Yağan,
IEEE International Conference on Communications (ICC), 2021 (*Best Paper Award*).

Existence and Size of the Giant Component in Inhomogeneous Random K -out Graphs

M. Sood, O. Yağan,
Conference of Decision and Control (CDC), 2020; long version under review with *IEEE Transactions on Information Theory*.

Spreading Processes with Mutations over Multi-layer Networks

M. Sood, A. Sridhar, R. Eleteby, C. W. Wu, S. A. Levin, H.V. Poor, O. Yağan,
Networks (NetSci), 2021; long version to be submitted to *PNAS*.

On the Robustness, Connectivity and Giant Component Size of Random K -out Graphs,

E. Elumar, M. Sood, O. Yağan,
International Symposium on Information Theory (ISIT) 2021; submitted to *IEEE Transactions on Information Theory*.

Platform Competition for Throughput in Two-sided Freelance Markets

M. Sood, A. A. Kulkarni, S. Moharir
IEEE International Conference on Signal Processing and Communications (SPCOM) 2018.

SELECTED INVITED TALKS

Epidemic Spreading of Mutating Contagions on Multi-layer Contact Networks.

- Department of Applied Mathematics, CU Boulder. Aug '22
- Bosch Center for Artificial Intelligence, Pittsburgh. Aug '22
- Dowd Fellowship Seminar, College of Engineering, CMU. Nov '21
- Center for Informed Democracy & Social-cybersecurity Conference, CMU. Jul '21

Designing Secure and Reliably Connected Networks with Random K -out Graphs.

- IoT Security & Privacy Seminar, CyLab Security & Privacy Institute, CMU, Oct '21, Oct '22

Heterogeneous Models for Designing Secure Ad-Hoc Networks and Controlling Spreading Phenomena

- MIT Rising Stars in EECS. Oct '21

SELECTED COURSEWORK & TECHNICAL SKILLS

Graduate Coursework (CMU)

Introduction to Machine Learning, Foundations of Privacy, Optimization, Statistical Machine Learning, Foundations of Cloud & Machine Learning Infrastructure, Graduate Algorithms, Graph Theory

Graduate Coursework (IIT Bombay)

Concentration Inequalities, Real Analysis, Network Economics, Game Theory, Information Theory & Coding, Markov Chains & Queueing Systems, Advanced Topics in Signal Processing

Teaching Assistantship (Graduate Courses)

- CMU: Advanced Probability & Statistics for Engineers (Spring '19), Applied Stochastic Processes (Spring '20)
- IIT Bombay: Communication Networks (Spring '18), Real Analysis (Fall '17)

Programming: Python, C++ (Basic)

Software & Tools: PyTorch, NumPy, Pandas, CVX, LaTeX

PROFESSIONAL SERVICE

Technical Program Organization & Reviewing

- Organizing the inaugural Pittsburgh Women in Mathematics and Computing Symposium (WMCS) 2023 funded by the Institute for Advanced Study (IAS), Princeton.
- Area Chair, Workshop on Information-Theoretic Methods for Rigorous, Responsible, and Reliable Machine Learning (ITR3 @ ICML-21) ICML 2021.
- Reviewer, IEEE Transactions on Information Theory, Journal of Communications and Networks, IEEE Transactions on Communications, IEEE Global Communications Conference (GLOBECOM).

Selected Outreach & Mentorship

- Awarded a \$3000 grant for organizing Math outreach activities and invited to present at 2024 Joint Mathematical Meetings by the IAS Women and Mathematics Program. *Aug '22*
- K-12 Outreach: Math Carnival with the IAS, Princeton Public Library, (May '22); CMU Society of Women Engineers Middle School Day (Mar '20, '21) and High School Day (Feb '22).
- Organized art-fundraisers supporting over 5000 meals at the Greater Pittsburgh Food Bank. *Aug '21 - Aug '22*
- Served on the ECE Diversity Committee to develop and launch the ECE Peer Mentorship Program, CMU. *Fall '21 - ongoing*
- Department Academic Mentor to 11 undergraduate students, IIT Bombay. *Apr' 16 - Jun '18*