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# VISHRANT TRIPATHI

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## RESEARCH INTERESTS

Communication Networks, Robotics, Next-Generation Wireless Systems, Cyber-Physical Systems, Machine Learning, and Optimization

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## EDUCATION

### MIT

*Aug 2017 - Aug 2023*

PhD, *Electrical Engineering and Computer Science*

Thesis Title: “**Information Freshness for Monitoring and Control over Wireless Networks**”

Minor in Economics & Policy

Advisor: **Prof. Eytan Modiano**

### MIT

*Aug 2017 - May 2019*

SM, *Electrical Engineering and Computer Science*

GPA: **5.0/5.0**

Thesis Title: “**Age of Information and Mobility**”

Advisor: **Prof. Eytan Modiano**

### IIT-Bombay

*Jul 2013 - Jun 2017*

B.Tech., *Electrical Engineering*

GPA: **9.63/10.0**

Minor in Computer Science

Advisor: **Prof. Sharayu Moharir**

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## PRESS COVERAGE

[MIT News](#), [AeroAstro MIT](#), [Schwarzman College of Computing](#), [Institute for Data Systems and Society MIT](#), [Wireless Communications Alliance](#), [AI Magazine](#), [Hackster.io](#), [TechXplore](#), [Autonomous Vehicle International](#), and [Quadricottero](#).

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## AWARDS AND HONORS

**Elmore Scholar of Excellence**, Purdue University,

*Aug 2023 - Aug 2028*

Award for research excellence and future potential to new faculty.

**Research Profile**, ACM SIGMETRICS Performance Review

*Dec 2023*

selected for a special issue on job market candidates.

**Best Presentation Award**, LIDS Student Conference

*Feb 2023*

for a talk titled *WiSwarm: Wireless Networking for Multi-Agent Robotics*.

**Best Paper Runner-Up**, ACM MobiHoc 2022

*Oct 2022*

for a paper titled *Optimizing Age of Information with Correlated Sources*.

**Best Presentation Runner-Up**, LIDS Student Conference

*Feb 2019*

for a talk titled *Age Optimal Information Gathering and Dissemination on Graphs*.

**Institute Academic Prize**, IIT-Bombay

*2015-16*

for exceptional academic performance, given to 10 students among 880.

**All India Rank 126**, Joint Entrance Examination (JEE)

*2013*

Top 0.01 percentile among 1.3 million candidates

**Young Scientist Fellowship**, KVPY, Govt. of India

*2011-13*

Awarded to the most promising high-school students in STEM in India

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## RESEARCH & INDUSTRY EXPERIENCE

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**Software Engineer**, NetInfra, Google, Sunnyvale

*Sep 2023 - Present*

- Work on the DataCenter Network Interconnection (DCNI) layer
- Use software defined networking (SDN) for routing and topology optimization in real-time

**Research Assistant**, Communications and Networking Research Group, MIT *Aug 2017 - Aug 2023*

- Used tools from probability, optimization, and learning to formulate and solve problems in networking and robotics
- Designed new network control policies to achieve timely information delivery in wireless networks
- Applied our fundamental theory results to robotics, edge computing, and cloud systems

**Software Engineer Intern**, TechInfra, Google, NYC

*May 2022 - Sep 2022*

- Worked on Sinapse2 - a real-time observed networked modeling system for traffic management in Google's network
- Designed and built an input replayer for this system for debugging, recreating network behavior during past events and improving fail-static policies

**Research Scientist Intern**, Capacity Engineering, Meta, Menlo Park

*May 2021 - Sep 2021*

- Worked on a large scale mixed-integer linear programming (MILP) solver, used for long term network capacity planning
- Added detailed constraint tracking and sensitivity analysis to provide deeper insights and interpretability for this solver
- Proposed an efficient way to perform sensitivity analysis for multiple groups of constraints in a MILP

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## PUBLICATIONS

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### Journals

[J1]: *Optimizing Age of Information with Correlated Sources.*

VT, E. Modiano; under review at IEEE/ACM Transactions on Networking 2023.

[J2]: *A Whittle Index Approach to Minimizing Functions of Age of Information.*

VT, E. Modiano; under review at IEEE/ACM Transactions on Networking 2023.

[J3]: *Fresh-CSMA: A Distributed Protocol for Minimizing Age of Information.*

VT, N. Jones, E. Modiano; IEEE Journal of Communications and Networks 2023.

[J4]: *Information Freshness in Multi-Hop Wireless Networks.*

VT, E. Modiano; IEEE/ACM Transactions on Networking 2022.

[J5]: *Age Optimal Information Gathering and Dissemination on Graphs.*

VT, R. Talak, E. Modiano; IEEE Transactions on Mobile Computing 2021.

### Conference Proceedings

[C1]: *Monitoring Correlated Sources: AoI-based Scheduling is Nearly Optimal.*

R. V. Ramakanth, VT, E. Modiano, to appear in IEEE INFOCOM, 2024.

[C2]: *WiSwarm: Age-of-Information-based Wireless Networking for Collaborative Teams of UAVs.*

VT, I. Kadota, E. Tal, M. S. Rehman, A. Warren, S. Karaman, E. Modiano; IEEE INFOCOM 2023.

[C3]: *Fresh-CSMA: A Distributed Protocol for Minimizing Age of Information.*

VT, N. Jones, E. Modiano; IEEE INFOCOM 2023.

[C4]: *Optimizing Age of Information with Correlated Sources.*

VT, E. Modiano; ACM Mobihoc 2022, **Best Paper Runner Up Award.**

[C5]: *An Online Learning Approach to Optimizing Time-Varying Costs of AoI.*

VT, E. Modiano; ACM MobiHoc 2021.

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- [C6]: *Computation and Communication Co-Design for Real-Time Monitoring and Control in Multi-Agent Systems.*  
VT, L. Ballotta, L. Carlone, E. Modiano; IFIP WiOpt 2021.
- [C7]: *A Whittle Index Approach to Minimizing Functions of Age of Information.*  
VT, E. Modiano; Allerton, 2019.
- [C8]: *Age Optimal Information Gathering and Dissemination on Graphs*  
VT, R. Talak, E. Modiano; IEEE INFOCOM 2019.
- [C9]: *Age of Information in Multi-Source Systems.*  
VT, S. Moharir; IEEE GlobeCom 2017.

### Theses

- [T1]: *Information Freshness for Monitoring and Control over Wireless Networks.*  
VT; PhD Thesis, MIT, 2023.
- [T2]: *Age of Information and Mobility.*  
VT; SM Thesis, MIT, 2019.

### Tech Reports, Workshops and Preprints

- [R1]: *Age Debt: A General Framework for Minimizing Age of Information.*  
VT, E. Modiano, IEEE INFOCOM AoI Workshop, 2021.
- [R2]: *Age of Information for Discrete Time Queues.*  
VT, R. Talak, E. Modiano; arXiv:1901.10463, 2019.

## TEACHING EXPERIENCE

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**Teaching Assistant**, 16.09 Probability and Statistics, MIT *Feb 2023 - May 2023*

- Taught introductory probability to sophomores in AeroAstro, rated **6.7/7.0**.
- Designed course material - problem sets, recitations, lecture notes and exams

**Teaching Assistant**, 6.7700 Fundamentals of Probability, MIT *Sep 2022 - Dec 2022*

- Taught recitations on measure theoretic probability to graduate students in EECS, rated **6.8/7.0**.
- Delivered an in-class lecture on mixing in Markov chains
- Designed problem sets and exams

**Kaufman Teaching Certificate Program**, MIT *Sep 2021 - Dec 2021*

- Participated in workshops covering a wide-range of topics such as course design, creating inclusive classes, engaging students to facilitate learning, and how to provide meaningful feedback to students.
- Learned about the art and practice of teaching at the university level through the program, including current research on teaching methodologies.

**Teaching Assistant**, 16.36 Comm. Systems and Networks, MIT *Feb 2020/21 - May 2020/21*

- Helped design a new software defined radio (SDR) lab for the course with experiments on sampling, modulation and practical aspects of wireless communication
- Converted the lab to a *remotely controlled* setup and ran successful lab sessions over zoom during the pandemic, rated **7.0/7.0**

## MENTORING AND VOLUNTEERING

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- Mentored MIT undergraduates M. Shahir Rehman (co-author on [C2]), currently a graduate student at Stanford, and Alexander Warren (co-author on [C2]), currently a software engineer at Google.
- Mentored MIT graduate students Nicholas Jones (co-author on [J3] and [C3]) and R. Vallabh Ramakanth (co-author on [C1]).

- Served as a mentor for the MIT EECS *Graduate Application Assistance Program* (GAAP) to help under-represented students prepare their graduate school applications.
- Served as an international student mentor for the *International Students Office* (ISO) at MIT.
- Volunteer and organizer for the *Indian Graduate Students Association* (Sangam) at MIT.
- Served as an English language tutor for undergraduates from rural backgrounds at IIT-Bombay.

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## SERVICE

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- Member of the poster session TPC at COMSNETS 2023 and 2024
- Co-Chair for the LIDS Student Conference 2020
  - Session Chair for the student session on Control and Robotics
  - Organizer for panel titled *From LIDS@80 to LIDS@100 - Discussing the Future of Research in LIDS*
- Organizing member of the LIDS & Stats Tea Talk Committee (2018-2020)
- Organizing volunteer for IFIP WiOpt 2021
- Session Chair at Allerton 2019 for the session on Wireless Communication Systems
- Reviewer for the following conferences
  - IEEE ISIT 2019, 2020, 2023
  - IFIP WiOpt 2023
  - COMSNETS 2023
  - IEEE GlobeCom 2022
  - IEEE Information Theory Workshop (ITW) 2021
  - IEEE INFOCOM AoI Workshop 2019
- Reviewer for the following journals
  - IEEE/ACM Transactions on Networking
  - IEEE Transactions on Mobile Computing
  - IEEE Transactions on Neural Networks and Learning Systems
  - IEEE Transactions on Information Theory
  - IEEE Transactions on Communications
  - IEEE Transactions on Wireless Communications
  - IEEE Transactions on Vehicular Technology
  - IEEE Journal on Selected Areas in Information Theory
  - IEEE Journal on Selected Areas in Communications
  - IEEE Communications Letters
  - IEEE Open Journal of the Communications Society (*Exemplary Reviewer Award*)
  - IEEE Internet of Things Journal

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## TALKS

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- Information Freshness with Correlated Sources and Distributed Protocols,** *Sep 2023*  
 Invited Talk, ECE, Rensselaer Polytechnic Institute, Troy, NY.
- Information Freshness for Monitoring and Control over Wireless Networks**
- PhD Thesis Defense, MIT *Aug 2023*
  - Invited Talk, Computer Science, Tata Institute of Fundamental Research, Mumbai *Dec 2022*
  - Invited Talk, Electrical Engineering, IIT-Bombay *Dec 2022*
  - Invited Talk, Nokia Bell Labs, NJ *Dec 2022*
  - LIDS/RLE Communication + Information Theory Seminar, MIT *Apr 2022*
- WiSwarm: AoI-based Wireless Networking for Collaborative Teams of UAVs,** *May 2023*  
 IEEE INFOCOM, NY.
- Fresh-CSMA: A Distributed Protocol for Minimizing Age of Information,** *May 2023*  
 IEEE INFOCOM, NY.
- WiSwarm: Wireless Networking for Multi-Agent Robotics,** *Feb 2023*

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LIDS Student Conference, MIT, *Best Presentation Award*.  
**Optimizing Age of Information with Correlated Sources**, *Oct 2022*  
ACM MobiHoc 2022, *Best Paper Runner-Up Award*.  
**An Online Learning Approach to Optimizing Time-Varying Costs of AoI**, *Oct 2021*  
ACM MobiHoc 2021, *Online*.  
**Computation and Communication Co-Design for Real-Time Monitoring and Control in Multi-Agent Systems**, *Oct 2021*  
IFIP WiOpt 2021, *Online*.  
**Age Debt: A General Framework For Minimizing Age of Information**,  

- LIDS and Stats Tea Talk, MIT. *Apr 2021*
- IEEE INFOCOM AoI Workshop, *Online* *May 2021*

**Online Learning for Restless Multi-Armed Bandits**, *Jan 2021*  
LIDS Student Conference, MIT.  
**A Whittle Index Approach to Minimizing Functions of Age of Information**, *Sep 2019*  
Allerton Conference on Communication, Control and Computing, UIUC.  
**Age Optimal Information Gathering and Dissemination on Graphs**,  

- IEEE INFOCOM, Paris. *May 2019*
- LIDS Student Conference, MIT, *Best Presentation Runner-Up*. *Feb 2019*

## SKILLS

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### Programming Languages and Frameworks

C/C++, Python, MATLAB, Labview, GNURadio, ROS, OpenFlow/MiniNet, L<sup>A</sup>T<sub>E</sub>X

### Languages

English (Native/Bilingual), Hindi (Native/Bilingual), Sanskrit (Intermediate), French (Beginner)

## REFERENCES

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**Prof. Eytan Modiano**, modiano@mit.edu, MIT  
**Prof. John Tsitsiklis**, jnt@mit.edu, MIT  
**Prof. Luca Carlone**, lcarlone@mit.edu, MIT  
**Prof. Roy Yates**, ryates@winlab.rutgers.edu, Rutgers University  
**Prof. Yin Sun**, yzs0078@auburn.edu, Auburn University