NICHOLAS JONES

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EDUCATION

Massachusetts Institute of Technology September 2022 - December 2025 (expected)
Doctor of Philosophy in Electrical Engineering and Computer Science
Advisor: Eytan Modiano

Massachusetts Institute of Technology September 2020 - August 2022
Master of Science in Electrical Engineering and Computer Science GPA: 4.90/5.00
Thesis: Optimizing random access for information freshness in spatially distributed wireless networks
Advisor: Eytan Modiano

University of Notre Dame August 2015 - May 2019
Bachelor of Science in Electrical Engineering, *magna cum laude* GPA: 3.89/4.00

RESEARCH INTERESTS

Communication networks, wireless, optimization, learning, information theory

ACADEMIC PUBLICATIONS

Conference Papers

[1] Nicholas Jones and Eytan Modiano. "Minimizing age of information in spatially distributed random access wireless networks". In: *IEEE INFOCOM 2023-IEEE Conference on Computer Communications*. IEEE. 2023, pp. 1–10.

[2] Vishrant Tripathi, Nicholas Jones, and Eytan Modiano. "Fresh-CSMA: A distributed protocol for minimizing Age of Information". In: *IEEE INFOCOM 2023-IEEE Conference on Computer Communications*. IEEE. 2023, pp. 1–10.

RESEARCH AND WORK EXPERIENCE

MIT Laboratory for Information and Decision Systems: Research Assistant September 2020 - Present

- Use mathematical tools to model and analyze complex problems in communication networks, with a particular focus on optimizing performance of wireless networks for real-time applications.
- Derived a novel random access scheduling policy for optimizing information freshness in wireless networks. Proved performance bounds and a significant improvement in theoretical performance over traditional policies.
- Implemented this policy on a testbed of software defined radios. Measured real-time performance and showed a 4x average improvement in information freshness compared to WiFi, and up to a 10x improvement for individual nodes.
- Currently researching the use of slicing in software defined networks to provide service guarantees over wireless and heterogeneous networks.

MIT Lincoln Laboratory: Research Intern June 2023 - August 2023

- Developed theoretical routing and scheduling algorithms to provide service guarantees in unreliable multi-hop wireless networks.
- Worked with the Tactical Networks group to simulate algorithm performance and show capabilities in semi-realistic tactical network scenarios.

Dirac Solutions: Consultant June 2021 - Present

- Developed synthetic aperture radar (SAR) algorithms to improve radar imaging resolution for object tracking.
- Ported a prototype audio communication system designed for military applications from a Raspberry Pi to a low-power microcontroller.

Marathon Petroleum Corporation: Project Engineer June 2019 - August 2020

- Managed electrical projects at petroleum terminals from project design through completion. Responsibilities included technical design, cost and schedule management, and contractor oversight.
- Communicated project details effectively with a wide variety of people including business partners, subject matter experts, field operators, and contractors.

Notre Dame Wireless Institute: Undergraduate Researcher August 2018 - December 2018

- Used software defined radios and GNU Radio to build a reliable link for real-time HD video in the presence of jamming.

ADDITIONAL EXPERIENCE

Reinforcement Learning Course: Solo Project Member — April 2022 - May 2022

- Used reinforcement learning techniques from Alpha Zero, including a neural network architecture and Monte Carlo Tree Search lookahead, to train a bot to play the card game Euchre, a complex team-based game with uncertainty and a very large state space.
- Observed modest performance results and a basic strategy, with limited computational power and training time.

Computer Vision Course: Solo Project Member — April 2022 - May 2022

- Trained a neural network using PyTorch and a publicly available image dataset to diagnose Ulcerative Colitis (UC) in patients and to classify its severity from medical imaging.
- Achieved better results than the state of the art work published on automated UC diagnosis.

Notre Dame EE Senior Design: Student Team Member — January 2019 - May 2019

- Designed, built, and programmed a device to record directional biosonar signals using beamforming and signal processing.
- Led the design of the device circuitry and PCB. Programmed two microcontrollers to control the device and to interface with each other and several peripherals, operating at near maximum speeds.

PROGRAMMING SKILLS

Languages: Python, C/C++, MATLAB, LaTeX | **Libraries:** CVXPY, PyTorch

RELEVANT COURSEWORK

Networks: Data Communication Networks (theory), Computer Networks (systems)

Probability: Fundamentals of Probability, Discrete Probability & Stochastic Processes

Optimization: Optimization Methods, Dynamic Programming & Reinforcement Learning, Statistical RL & Decision Making

Information Theory: Information Theory, Inference and Information

Misc: Cryptography, Computer Vision, Negotiation and Influence Skills for Technical Leaders

ACTIVITIES AND LEADERSHIP

Undergraduate Research Mentor — January 2023 - Current

- Mentoring an undergraduate student at MIT through the research process of implementing and testing a novel wireless random access protocol on a software-defined radio testbed.

MIT 16.36 (Communication Systems and Networks) Course TA — January 2022 - May 2023

- Taught the lab section of a digital communications course using software-defined radios for two consecutive years. Worked closely with students to answer questions and to deepen their understanding of the course material.

LIDS Social Committee Member — September 2022 - May 2023

- Assist with organizing and managing social events to foster community and an inclusive environment within the lab.

MIT EECS Graduation Application Assistance Program — September 2022 - December 2022

- Mentored a PhD applicant from an underrepresented group and helped guide them through graduate school applications.

Notre Dame Alumni Hall Resident Assistant — September 2018 - May 2019

- Oversaw a residence hall section of fifty undergraduate students, working with other hall staff members to maintain a safe and healthy environment.

Notre Dame Social Concerns Seminars — September 2016 - January 2018

- Learned about systemic issues that bring about poverty in both rural and urban areas.
- Spent a week in the Appalachian region helping flood victims with home repair and several days in low-income neighborhoods working with the homeless and formerly incarcerated.

HONORS AND AWARDS

Tau Beta Pi Engineering Honor Society

- Inducted November 15, 2017.

Eta Kappa Nu Electrical Engineering Honor Society

- Inducted October 5, 2017. Served as Delta Sigma chapter president.