NICHOLAS JONES

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EDUCATION

Massachusetts Institute of Technology September 2022 - August 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

Homeschool August 2011 - May 2015
National Merit Scholar | ACT: 36/36 | SAT: 1600/1600 GPA: 4.00/4.00

RESEARCH INTERESTS

Communication networks, wireless, optimization, information theory, data privacy

ACADEMIC PUBLICATIONS

Preprints (accepted to IEEE INFOCOM 2023)

[1] Nicholas Jones and Eytan Modiano. *Minimizing Age of Information in Spatially Distributed Random Access Wireless Networks*. 2022. arXiv: 2212.03998.

[2] Vishrant Tripathi, Nicholas Jones, and Eytan Modiano. *Fresh-CSMA: A Distributed Protocol for Minimizing Age of Information*. 2022. arXiv: 2212.03087.

EXPERIENCE

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

- Use mathematical tools to model and analyze complex theoretical problems in communication networks, with an emphasis on optimization and proving results in network control and performance.
- Derived a novel policy for optimizing information freshness in a random access wireless network, designed for sensor or IoT 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 observed significant improvements in information freshness compared to WiFi.

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.

Dirac Solutions: Consultant June 2021 - September 2021

- 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 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.

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 interference.
· Successfully demonstrated system performance to the U.S. Army.

PROGRAMMING SKILLS

Languages: Proficient in Python, C/C++, MATLAB, LaTeX | Experience with Julia, Verilog

Libraries: Experience with PyTorch

RELEVANT COURSEWORK

MIT: Data Communication Networks (theory), Computer Networks (systems), Fundamentals of Probability, Optimization Methods, Dynamic Programming and Reinforcement Learning, Information Theory, Inference and Information, Cryptography, Computer Vision

Notre Dame: Communication Systems, Control Systems, Digital Signal Processing

ACTIVITIES AND LEADERSHIP

MIT EECS Graduation Application Assistance Program September 2022 - Current

· Mentor a PhD applicant from an underrepresented group and help guide them through the graduate school application process.

LIDS Social Committee September 2022 - Current

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

MIT Communication Systems and Networks Course TA January 2022 - May 2022

· Taught the lab section of an undergraduate communications course, including how to program software-defined radios. Worked closely with students to answer questions and to deepen their understanding of the course material.

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.
· Spent 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.

Notre Dame Boeing Scholar

· Awarded a Boeing scholarship in 2017 and 2018 for excellent academic achievement and representation of Boeing's values.