NICHOLAS ROBER

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EDUCATION

Massachusetts Institute of Technology — Cambridge, MA
PhD, Aeronautics and Astronautics — 2023 – Present

SM, Aeronautics and Astronautics — 2023
Thesis: *BReach-LP: a Framework for Backward Reachability Analysis of Neural Feedback Loops*

University of Iowa — Iowa City, IA
BSE, Mechanical Engineering — 2020

RESEARCH EXPERIENCE

Massachusetts Institute of Technology — Cambridge, MA
Graduate Research Assistant | Aerospace Controls Lab — 2021 – Present
Advisor: Jonathan How

- Conduct industry-sponsored research on verification and synthesis of safe autonomous systems under uncertainty
- Present and defend findings through written journal and conference submissions and presentations at group meetings, conferences, and workshops
- Contribute to writing and conceptualization of funding proposals

University of Iowa — Cambridge, MA
Undergraduate Research Assistant | Cooperative Autonomous Systems Lab — 2019 – 2021
Advisor: Venanzio Cichella

- Designed algorithms for motion planning and obstacle avoidance of underwater vehicles
- Compared adaptive and classical control methods and presented findings in a journal publication

AWARDS

Outstanding Student Paper Award — 2023
IEEE Aerospace Technical Commitee
Backward Reachability Analysis of Neural Feedback Loops

Runner up, Best Paper Award — 2022
ICML Workshop for Verification in Machine Learning
Backward Reachability Analysis of Neural Feedback Loops

Best Undergraduate Presentation — 2020
The University of Iowa Department of Mechanical Engineering
Geometric Path Following for Underwater Vehicles

PUBLICATIONS

Refereed Journal Articles

- **Rober, Nicholas**, S. M. Katz, C. Sidrane, *et al.*, "Backward reachability analysis of neural feedback loops: Techniques for linear and nonlinear systems," *IEEE Open Journal of Control Systems*, 2023.
- J. E. Martin, M. Hammond, **Rober, Nicholas**, *et al.*, "Reduced order model of a generic submarine for maneuvering near the surface," *arXiv preprint arXiv:2212.09821*, 2022.
- **Rober, Nicholas**, M. Hammond, V. Cichella, *et al.*, "3d path following and l1 adaptive control for underwater vehicles," *Ocean Engineering*, vol. 253, p. 110 971, 2022.
- **Rober, Nicholas**, V. Cichella, J. Ezequiel Martin, *et al.*, "Three-dimensional path-following control for an underwater vehicle," *Journal of guidance, control, and dynamics*, vol. 44, no. 7, pp. 1345–1355, 2021.

Refereed Conference Articles

- **Rober, Nicholas**, K. Mahesh, T. M. Paine, *et al.*, "Online data-driven safety certification for systems subject to unknown disturbances," *arXiv preprint arXiv:2310.19256*, 2023.
- **Rober, Nicholas**, M. Everett, S. Zhang, *et al.*, "A hybrid partitioning strategy for backward reachability of neural feedback loops," in *2023 American Control Conference (ACC)*, IEEE, 2023, pp. 3523–3528.
- **Rober, Nicholas**, M. Everett, and J. P. How, "Backward reachability analysis for neural feedback loops," in *2022 IEEE 61st Conference on Decision and Control (CDC)*, IEEE, 2022, pp. 2897–2904.
- **Rober, Nicholas A** and V. Cichella, "Geometric path following of underwater vehicles," in *AIAA Scitech 2021 Forum*, 2021, p. 1678.

TEACHING EXPERIENCE AND TRAINING

Guest Lectures — Northeastern University
Verifiable Machine Learning — Fall 2023

Pedagogical Training
MIT Communications Lab Training — 2023-2024

- Participated in ten training sessions designed to teach graduate students how to become effective coaches in various aspects of technical communication.

Undergraduate Teaching Assistantship — The University of Iowa
Control of Mechanical Engineering Systems — Fall 2020
Advanced Linear Control Systems — Spring 2020
Introduction to Engineering Computing — Fall 2018, Fall 2019
Engineering Fundamentals I: Statics — Summer 2018, Summer 2019

PRESENTATIONS

International Conference on Robotics and Automation (ICRA) — 2024
Allerton Conference, Invited Talk — 2023
American Control Conference (ACC), Talk — 2023
Conference on Decision and Control (CDC), Talk — 2022
ICML Workshop on Formal Verification of Machine Learning, Talk — 2022
ICRA Workshop on Safe and Reliable Robot Autonomy under Uncertainty, Talk — 2022
AIAA Scitech Forum, Talk — 2021

PROFESSIONAL ACTIVITIES

Internal Services
Massachusetts Institute of Technology
Fellow, AeroAstro Communications Lab — 2023-2024
Student Liason, LiDS Seminar Speaker Series — 2023
Mentor, Freshman Pre-Orientation Program — 2022

University of Iowa
Panelist, New Student Seminar — 2019

Review Activities
Journals
IEEE Transactions on Automation and Control (TAC)
Nonlinear Analysis: Hybrid Systems
Ocean Engineering

Conferences
Learning for Dynamics and Control (L4DC)