

NICHOLAS ROBER

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EDUCATION

Massachusetts Institute of Technology PhD, Aeronautics and Astronautics	Cambridge, MA 2023 – Present
SM, Aeronautics and Astronautics Thesis: <i>BReach-LP: a Framework for Backward Reachability Analysis of Neural Feedback Loops</i>	2023
University of Iowa BSE, Mechanical Engineering	Iowa City, IA 2020

RESEARCH EXPERIENCE

Massachusetts Institute of Technology Graduate Research Assistant Aerospace Controls Lab Advisor: Jonathan How	Cambridge, MA 2021 – Present
<ul style="list-style-type: none">• 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 Undergraduate Research Assistant Cooperative Autonomous Systems Lab Advisor: Venanzio Cichella	Cambridge, MA 2019 – 2021
<ul style="list-style-type: none">• 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 IEEE Aerospace Technical Committee <i>Backward Reachability Analysis of Neural Feedback Loops</i>	2023
Runner up, Best Paper Award ICML Workshop for Verification in Machine Learning <i>Backward Reachability Analysis of Neural Feedback Loops</i>	2022
Best Undergraduate Presentation The University of Iowa Department of Mechanical Engineering <i>Geometric Path Following for Underwater Vehicles</i>	2020

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.
- **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.

Theses

- **Rober, Nicholas**, “Breach-lp: A framework for backward reachability analysis of neural feedback loops,” M.S. thesis, Massachusetts Institute of Technology, Department of Mechanical Engineering, 2023.

TEACHING EXPERIENCE AND TRAINING

Guest Lectures

Verifiable Machine Learning

Northeastern University
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

Control of Mechanical Engineering Systems
Advanced Linear Control Systems
Introduction to Engineering Computing
Engineering Fundamentals I: Statics

The University of Iowa
Fall 2020
Spring 2020
Fall 2018, Fall 2019
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

Panelist, MIT Communications Lab Summer Institute

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)

Workshops

Robotics Science and Systems 2024 Workshop: Towards Safe Autonomy (RSS)