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

Preprints (Under Review)

- **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.

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**, 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

Guest Lectures	Northeastern University
Verifiable Machine Learning	Fall 2023
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

Allerton Conference, Invited Talk	2023
American Control Conference, Talk	2023
Conference on Decision and Control, 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