Saber Omidi

Ph.D. Candidate in Mechanical Engineering
Safety-Critical Control | Robotics | Stochastic Decision-Making

Durham, NH | 603-285-8904 | saber.omidi@unh.edu
LinkedIn | Google Scholar | GitHub: ROS2 Project | Research Demonstrations

Graduate research and teaching assistant at the University of New Hampshire (Ph.D. expected May 2027). Research spans nonlinear and safety-critical control, robotics, reinforcement learning, and stochastic optimization, with experience in hardware experiments and ROS2 simulation.

Research and Engineering Experience

Graduate Research Assistant Sep 2022 – Present
University of New Hampshire | Durham, NH

- Designed safety-critical tracking and attitude controllers for UAVs and quadrotors using barrier functions, SDRE, and optimal-control methods.
- Developed constrained average-reward MDP formulations and optimal lottery-based non-stationary policies for probabilistic reach-avoid problems.
- Implemented and experimentally evaluated data-driven optimal derivative-feedback controllers for active magnetic levitation using reinforcement learning and system identification.
- Collaborated across Mechanical Engineering, Computer Science, and Electrical and Computer Engineering on NSF-supported NIIM research (Award 2218063).

Graduate Research Assistant Oct 2019 – Sep 2021
Vibrations and Dynamics Laboratory, University of Kurdistan | Sanandaj, Iran

- Led mechanical design, construction, modeling, and control of a cable-suspended planar parallel robot for real-time trajectory tracking.
- Implemented SDRE controllers accounting for actuator dynamics and cable-tension constraints; published theoretical and experimental results in the *Journal of Intelligent & Robotic Systems*.

Technical Skills

Programming: Python, C++, MATLAB, Julia, C; Git, Linux, LaTeX

Robotics and engineering: ROS2, Gazebo, Simulink, SOLIDWORKS, real-time control, system identification, hardware testing

Control: Nonlinear and optimal control, MPC, control barrier functions, SDRE, PID

Optimization: MDPs, CMDPs, dynamic programming, linear and quadratic programming, convex optimization; JuMP, MOSEK, Gurobi

Machine learning: Deep reinforcement learning, PyTorch, TensorFlow, Keras, scikit-learn, data analysis

Education

Ph.D., Mechanical Engineering Sep 2022 – Expected May 2027
University of New Hampshire, Durham, NH | GPA: 3.83/4.00
Research: safety-critical optimal control and stochastic decision-making. Proposal defended May 2026.

M.S., Mechanical Engineering Sep 2018 – Sep 2021
University of Kurdistan, Sanandaj, Iran | GPA: 3.50/4.00 | **Ranked 1st in cohort**
Thesis: Design and Control of Cable Robots Using the State-Dependent Riccati Equation.

B.S., Mechanical Engineering Oct 2013 – Mar 2017
Azad University, Qazvin, Iran | Top 10% of class

Accepted Future Appointment

Postdoctoral Researcher, Computer Science, University of New Hampshire
Supervisor: Marek Petrik | Anticipated start: September 1, 2027.
Accepted offer; appointment contingent on Ph.D. completion and sufficient NSF funding.

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Publications and Manuscripts

Journal articles

1. Y. Batmani and **S. Omidi**. **"On Suboptimal Safety-Critical Tracking Controller Design."** *Automatica*, vol. 196, article 113352, 2027.
2. **S. Omidi**, R. A. Ebunle, and S. Y. Yoon. **"Optimal Derivative Feedback Control for an Active Magnetic Levitation System: An Experimental Study on Data-Driven Approaches."** *IEEE/ASME Transactions on Mechatronics*, pp. 1–11, 2026.
3. **S. Omidi**, Y. Batmani, and S. Farhadi. **"Time-Varying Trajectory Tracking Controller Design for Cable-Suspended Planar Parallel Robots."** *Journal of Intelligent & Robotic Systems*, vol. 108, article 76, 2023.
4. C. Burvill, M. M. Kheirkhah, **S. Omidi**, and S. Gohari. **"Fracture Analysis of Conical Shells Containing an Internal Semi-Elliptical Crack."** *Analytical and Numerical Methods in Mechanical Design*, vol. 1, no. 1, p. 19, 2022.

Conference papers

5. **S. Omidi** and S. Y. Yoon. **"Model-Free Derivative Feedback Control for Active Magnetic Levitation System."** *IEEE Conference on Control Technology and Applications (CCTA)*, pp. 371–376, 2025.
6. **S. Omidi**, Y. Batmani, B. Mu, and M. W. Thein. **"On the Design of Safety-Critical Nonlinear Tracking Controllers for Attitude Control UAV."** *American Control Conference (ACC)*, pp. 408–413, 2025.

Preprints and submitted manuscripts

7. **S. Omidi**, M. Begum, M. Petrik, and S. Y. Yoon. **"Computing Optimal Non-stationary Policies for the Probabilistic Reach-Avoid Problems."** arXiv:2611.25517, 2026. Submitted to *IEEE Transactions on Automatic Control*.
8. **S. Omidi**, M. Petrik, S. Y. Yoon, and M. Begum. **"Probabilistic Safety Guarantee for Stochastic Control Systems Using Average Reward MDPs."** arXiv:2511.08419, 2025.
9. **S. Omidi**. **"SDC-Based Model Predictive Control: Enhancing Computational Feasibility for Safety-Critical Quadrotor Control."** arXiv:2509.24208, 2025.

Teaching and Research Mentoring

Graduate Teaching Assistant Sep 2022 – Present

Department of Mechanical Engineering, University of New Hampshire

- Provided laboratory instruction and technical support for approximately **200 undergraduate students**: **ME 747 Senior Laboratory** (three semesters) and **ME 646 Junior Laboratory** (one semester).
- Guided experiments, data analysis, technical reports, equipment troubleshooting, and final projects; graded coursework and held office hours.

Graduate Research Mentor Summers 2025 and 2026

NSF NIIM Summer Internship Program, University of New Hampshire

- Mentored undergraduate interns in ROS2, Gazebo, PID control, and real-time robotics; developed instructional materials and code connecting simulation, sensing, control, and hardware.

Professional Service

Peer Reviewer 2024 – Present

Transactions of the Institute of Measurement and Control.
Reviewed manuscripts in control systems, robotics, measurement, and automation.