

NAREK HARUTYUNYAN

[Website](#) | [Google Scholar](#) | narek.harutyunyan@brown.edu | +1 (857) 404-2113

EDUCATION

Brown University

Bachelor of Science in Computer Engineering | GPA: 4.0/4.0

Sep 2022 – May 2026

Providence, RI, USA

University of New South Wales

Study Abroad Program in Computer Engineering and Robotics

Jan – May 2025

Sydney, Australia

RESEARCH EXPERIENCE

Brown University | [Prof. Nora Ayanian](#)

Undergraduate Researcher (UTRA Scholar) at [ACT Lab](#)

Nov 2022 – Present

Providence, RI, USA

- Design reinforcement learning policies in IsaacLab for cooperative object transport with swarms of Crazyflie drones, enabling robust multi-agent coordination.
- Characterized quadcopter downwash interactions using Particle Image Velocimetry and MATLAB, improving close-proximity flight stability and formation safety.
- Engineered a custom aerial painting quadrotor and Python control pipeline used as the core hardware platform for 75+ students in project-based robotics courses.
- Built a real-time LED + audio-responsive quadrotor choreography system in Python and C, enabling synchronized drone performances that react dynamically to music.

California Institute of Technology | [Prof. Soon-Jo Chung](#)

Research Intern (SURF Fellow) at [ARCL Lab](#)

May – Sep 2025

Pasadena, CA, USA

- Engineered a high-fidelity IsaacLab simulation of the Unitree Go1 quadruped on a moving ground plane, emulating ship-like dynamics to address the sim-to-real gap in maritime environments.
- Developed a certified RL algorithm with contraction theory for stable quadruped locomotion and handstands on a moving platform, achieving 100% success rate across all hardware trials.
- Built a custom SDK for real-robot deployment and validated Unitree Go1 policies under extreme disturbances, including wind on a motion platform and tests on an inflatable boat.
- Designed and deployed reinforcement learning policies for locomotion and fault recovery on the humanoid robot Booster T1, demonstrating reliable performance on hardware.

Carnegie Mellon University | [Prof. Sebastian Scherer](#)

Research Intern (RISS Scholar) | Remote Researcher at [AirLab](#)

May 2024 – Jul 2025

Pittsburgh, PA, USA

- Refactored the MapEx framework (probabilistic frontier-based exploration with predictive maps) into Gym, added an IoU evaluation metric, and fixed algorithmic issues like agent backtracking.
- Proposed and led MapExRL, a human-inspired RL exploration framework using frontier-based planning, global map predictions, and uncertainty modeling for long-horizon reasoning.
- Achieved up to 18.8% performance gains over state-of-the-art exploration baselines on real-world indoor maps with MapExRL.

PUBLICATIONS AND POSTERS

- [1] N. Harutyunyan*, B. Moon*, S. Kim, C. Ho, A. Hung, S. Scherer, “**MapExRL: Human-Inspired Indoor Exploration with Predicted Environment Context and Reinforcement Learning**,” to appear at the IEEE International Conference on Advanced Robotics (ICAR), 2025; presented at ICRA 2025 Workshop on Structured Learning for Efficient, Reliable, and Transparent Robots | [📄](#) | [🔗](#)
- [2] V. Zinage*, N. Harutyunyan*, E. Verheyden*, F. Hadaegh, S.-J. Chung, “**ContractionPPO: Certified Reinforcement Learning via Differentiable Contraction Layers**,” in IEEE Robotics and Automation Letters (RA-L), under review | [📄](#) | [🔗](#)

- [3] C. Ho*, S. Kim*, B. Moon, A. Parandekar, **N. Harutyunyan**, C. Wang, K. Sycara, G. Best, S. Scherer, “**MapEx**: Indoor Structure Exploration with Probabilistic Information Gain from Global Map Predictions,” in IEEE International Conference on Robotics and Automation (ICRA), 2025 | [📄](#) | [🔗](#)
- [4] A. Kiran, **N. Harutyunyan**, N. Ayanian, K. Breuer, “**Downwash Dynamics**: Impact of Quadrotor Separation on Forces, Moments, and Velocities for Dense Formation Flight,” in AIAA Aviation Forum and ASCEND, 2024 | [📄](#)
- [5] O. Heng*, **N. Harutyunyan***, J. Dhanda*, “RoboChaser,” presented at Brown University Deep Learning Day — TAs’ Choice Award for Best Project among 100+ projects, 2024 | [🔗](#)
- [6] A. Min*, R. Hossain*, H. Izhar*, **N. Harutyunyan***, “Advancements in Multi-Robot Systems,” presented at Yale Northeast Robotics Colloquium (NERC), 2023 | [📄](#)

* denotes equal contribution

TEACHING EXPERIENCE

Creating Art with Teams of Robots | *Head TA* **Spring 2024, Fall 2024, Spring 2026**

- Guided 75+ students weekly in labs and final projects, ensuring successful execution through hands-on mentorship and teamwork.
- Developed and evaluated final project concepts using Crazyflie quadcopters, quadrupeds, and ground robots, incorporating the innovative painter drone designed in previous ACT Lab research.

Deep Learning | *Teaching Assistant* **Fall 2025**

- Support a 120+ student course by designing labs and assignments on deep learning, and leading biweekly workshops on emerging AI trends.
- Hold weekly office hours and mentor final project teams, providing personalized guidance on technical challenges and the design of deep learning solutions in robotics and AI.

Introduction to Engineering | *Teaching Assistant* **Fall 2023**

- Coached 40+ students in engineering projects, including chair construction, electrical door locking mechanisms, and electric guitar building.
- Led workshops for 100+ students on MATLAB, CAD (Fusion 360), prototyping (3D printing, laser cutting), machine shop tools, and Arduino-based electronics.

AWARDS AND HONORS

Tau Beta Pi Engineering Honor Society <i>Inducted member recognizing academic excellence in engineering</i>	Fall 2024 – Present <i>Providence, RI, USA</i>
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Summer Undergraduate Research Fellowships (SURF) <i>California Institute of Technology</i>	Summer 2025 <i>Pasadena, CA, USA</i>
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Robotics Institute Summer Scholar (RISS) <i>Carnegie Mellon University</i>	Summer 2024 <i>Pittsburgh, PA, USA</i>
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Undergraduate Teaching and Research Award (UTRA) <i>Brown University</i>	Summer 2023, Fall 2023 <i>Providence, RI, USA</i>
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Huys Scholar <u>Huys Foundation STEM Scholarship</u> 🔗 (5% selection rate)	Awarded 2023, 2024 <i>West Hollywood, CA, USA</i>
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TECHNICAL SKILLS

Programming Languages: Python, C, C++, Java, JavaScript

Frameworks: ROS, Gazebo, IsaacSim & IsaacLab, PyBullet, Mujoco, TensorFlow, PyTorch, NumPy

Robotics Toolchain: SolidWorks, Fusion 360, MATLAB, Vicon, OptiTrack, Crazyflie, Unitree Go1, Boston Dynamics Spot, iRobot Create3 (Roomba-class), TurtleBot, (others)