Narek Harutyunyan

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Education

Brown University **Expected May 2026**
Bachelor of Science in Computer Engineering | GPA: 4.0 Providence, RI, USA

University of New South Wales **January – May 2025**
Study Abroad Program in Computer Engineering and Robotics Sydney, Australia

Relevant Courses: *Learning and Sequential Decision Making (Graduate Level)* | *Deep Learning* | *Computer Systems* | *Artificial Intelligence* | *Coordinated Mobile Robotics (Graduate Level)* | *Digital Electronics Systems Design* | *Dynamics and Vibrations* | *Linear System Analysis* | *Linear Algebra*

Skills

Programming Languages: Python, C, C++, Java, JavaScript
Frameworks: ROS, Gazebo, IsaacLab, PyBullet, Mujoco, TensorFlow, PyTorch, NumPy
Design & Analysis Software: SolidWorks, Fusion 360, MATLAB

Research Experience

Undergraduate Teaching and Research Awards (UTRA) **May 2023 – Present**
Brown University | *Dr. Nora Ayanian* | *ACT Lab* *Providence, RI, USA*

- Design reinforcement learning policies in IsaacLab for cooperative object transport with swarms of Crazyflie drones, enabling robust multi-agent coordination.
- Characteriz quadcopter downwash interactions using Particle Image Velocimetry and MATLAB, improving close-proximity flight stability and formation safety.
- Engineer an aerial painting quadrotor with custom 3D-printed components and Python control wrappers for the Crazyswarm library, increasing usability for non-expert operators.
- Develop dynamic quadrotor performances with synchronized LED lighting and real-time audio processing in Python/C, creating responsive drone choreography to music.

Summer Undergraduate Research Fellowships (SURF) **May – September 2025**
California Institute of Technology | *Dr. Soon-Jo Chung* | *ARCL Lab* *Pasadena, CA, USA*

- Engineered a high-fidelity IsaacLab simulation of the Unitree Go1 quadruped on a moving ground plane, emulating ship-like dynamics for robust policy training.
- Developed a certified RL algorithm with contraction theory for stable quadruped locomotion and handstands on a moving platform, achieving 100% deployment success.
- Built a custom SDK for real-robot deployment and validated Unitree Go1 policies under 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.

Robotics Institute Summer Scholar Program (RISS) **May 2024 – July 2025**
Carnegie Mellon University | *Dr. Sebastian Scherer* | *AirLab* *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.

Teaching Experience

Deep Learning | *Teaching Assistant* **September 2025 – Present**

- Develop homework assignments and laboratory exercises to reinforce core concepts in neural networks, optimization, and deep learning applications.
- Hold weekly one-on-one office hours to provide personalized support, clarify course material, and guide students through technical challenges.
- Mentor final group projects, advising students on the design and implementation of deep learning solutions across diverse application areas in robotics and AI.

Creating Art with Teams of Robots | *Head Teaching Assistant* **January – December 2024**

- Served as Teaching Assistant in Spring 2024 and promoted to Head Teaching Assistant in Fall 2024, supporting course instruction and student learning.
- Guided 50+ 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.

Introduction to Engineering | *Teaching Assistant* **September – December 2023**

- Coached over 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.

Publications and Posters

[1] 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, 2025 | Website

[2] **N. Harutyunyan***, B. Moon*, S. Kim, C. Ho, A. Hung, S. Scherer, "MapExRL: Human-Inspired Indoor Exploration with Predicted Environment Context and Reinforcement Learning," in IEEE International Conference on Advanced Robotics (ICAR), 2025 | Paper | Website

[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 | Paper | Website

[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 | Paper

[5] A. Min*, R. Hossain*, H. Izhar*, **N. Harutyunyan***, "Advancements in Multi-Robot Systems," presented at Yale Northeast Robotics Colloquium (NERC), 2023 | Poster

Awards and Honors

Tau Beta Pi Engineering Honor Society **2025**
Inducted member recognizing academic excellence in engineering *Providence, RI, USA*

Summer Undergraduate Research Fellowships (SURF) **2025**
California Institute of Technology *Pasadena, CA, USA*

Robotics Institute Summer Scholar (RISS) **2024**
Carnegie Mellon University *Pittsburgh, PA, USA*

Undergraduate Teaching and Research Award (UTRA) **2023, 2024**
Brown University *Providence, RI, USA*

Huys Scholar **2023, 2024**
Huys Foundation STEM Scholarship *Yerevan, Armenia*