Lee Milburn

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Education

University of Pennsylvania Fall 2023 – expected May 2025
MSE, Robotics *Philadelphia, PA*

Northeastern University Fall 2018 – May 2023
BS, Computer Engineering and Computer Science *Boston, MA*

Research Experience

The General Robotics Automation Sensing and Perception Laboratory Oct, 2023 – Present
Research Assistant *Philadelphia, PA*

- Master's thesis on generating a multi-modal sensing informed physics simulation, used to learn adaptive control.
- Developed an autonomous system for detecting terrain transitions and feeding real-time friction parameters for each terrain type into a Non-Linear Model Predictive Controller (NMPC) for adaptive control.
- Engineered a new F1-Fifth autonomous vehicle research platform, integrating hardware and software.
- Applied a physics-informed Koopman Operator to model dynamics quadrotor dynamics in an NMPC.

The Robotics and Intelligent Vehicles Research Laboratory Sept, 2020 – Aug, 2023
Undergraduate Researcher *Boston, MA*

- Developed Autonomous UAV - UGV system to identify and pick up trash.
- Wrote networking and collected data for system which uses RGB-D and Hyperspectral data to classify terrain types in real-time for VAST project.
- Designed and constructed autonomous PPE material tests according to industry standards for ACE PPE project. Wrote the system's networking, decision making, and GUI.

The Dynamic Legged Systems Laboratory July, 2022 – Dec, 2022
Guest Researcher *Genova, Italy*

- Developed higher level control for autonomous navigation stack on Vinum-EU precision agriculture project.
- Algorithms for accurately generating navigation waypoints from RGB-D sensors during runtime, while navigating down the vineyard row.
- Trained and implemented a Mask-RCNN to do semantic segmentation of grapevine trunks for autonomous navigation. Hand annotated data-set of 500+ images.

Publications

Forthcoming Manuscripts

1 R. Tumu*, **L. Milburn***, A. Amine, R. Gupta, U. Kono, and R. Mangharam *"Physics-Constrained and Vision-Informed Friction Coefficient Estimation"* in preparation for Robotics Automation Letters (RA-L).

Conference Papers

1 **L. Milburn**, J. Chiaramonte, J. Fenton and T. Padir, *"TRASH: Tandem Rover and Aerial Scrap Harvester ,"* 2023 Robotics Automation and Artificial Intelligence (RAAI), Singapore, Singapore, 2023, pp. 259-265, doi: 10.1109/RAAI59955.2023.10601262.

2 **L. Milburn**, J. Gamba, M. Fernandes and C. Semini, *"Computer-Vision Based Real Time Waypoint Generation for Autonomous Vineyard Navigation with Quadruped Robots,"* 2023 IEEE International Conference on Autonomous Robot Systems and Competitions (ICARSC), Tomar, Portugal, 2023, pp. 239-244, doi: 10.1109/ICARSC58346.2023.10129563.

3 M. H. Shaham, M. Skopin, H. Hochsztein, K. Mabulu, **L. Milburn**, J. Tukpah, A. Tunik, J. Winn, M. Zolotas, D. Erdogmus, and T. Padir, *"Human-Supervised Automation Test Cell to Accelerate Personal Protective Equipment Manufacturing During the COVID-19 Pandemic,"* in 2022 IEEE International Symposium on Technologies for Homeland Security (HST), Boston, MA, USA, 2022, pp. 1-8, doi: 10.1109/HST56032.2022.10025429.

Extended Abstracts

1 R. Tumu, A. Amine, **L. Milburn**, L. Jia, K. Liu, U. Kono, and R. Mangharam *"Physics-Constrained and Vision-Informed Friction Coefficient Estimation"* in 40th Anniversary of the IEEE International Conference on Robotics and Automation, November 23-26, 2024.

2 **L. Milburn**, J. Chiaramonte, J. Fenton, *"Towards an Error Tolerant Multi-Robot System for Roadside Trash Collection."* in 2022 International Symposium on Distributed Autonomous Robotic Systems, November 25-28, 2022.

3 **L. Milburn**, J. Gamba, and C. Semini, *"Towards Computer-Vision Based Vineyard Navigation for Quadruped Robots"* in 2022 Institute for Robotics and Intelligent Machines, October 7-9, 2022. https://doi.org/10.5281/zenodo.7531328

Awards & Honors

1st Place in ECE Capstone Competition 2022 Award
Northeastern ECE Department *2022*

Project-Based Exploration for the Advancement of Knowledge (PEAK): Summit Award
Northeastern Undergraduate Research and Fellowships *2022*

Fung Leadership Award
Fung Scholars and Fellows *2022*

PEAK: Shout it out Award
Northeastern Undergraduate Research and Fellowships *2022*

Presidential Global Scholarship
Northeastern Global Experience Office *2022*

Graduate School Application Fund Award
Northeastern Undergraduate Research and Fellowships *2022*

Northeastern Achievement Award
Northeastern University *2019-2022*

Teaching Experience & Mentorship

ESE 6150 F1/10th Autonomous Racing January, 2025 – May, 2025
Teacher's Assistant *Philadelphia*

- Built F1tenth autonomous cars for the class.
- Lectured on technical algorithms such as the Pose Graph Slam and Rapidly Exploring Random Trees and corresponding lab implementations.
- Held office hours, and grading.

RoboRacer Bootcamp January, 2025 – January, 2025
Teacher's Assistant *Philadelphia*

- Taught visiting students from NYU and Gyeongsang National University the F1/10th syllabus over the course of a week.

F1-18 Graduate Mentor October, 2024 – Present
Robotics Mentor *Philadelphia*

- Mentor undergraduate students on building out the smaller scale F1-18 autonomous Racing Car.
- Mentor on a new outreach initiative to teach high school students in Philadelphia the robotics knowledge taught in the F1-10th course.

FIRST Robotics Mentor September, 2023 – Present
Robotics Mentor *Online*

- Mentor on Highschool Robotics FIRST team which reached the 2024 World Championships.
- Worked through computer vision principles and helped debug team's technical issues.

CS 2510 Fundamentals of Computer Science 2 January, 2023 – May, 2023
Teacher's Assistant *Online*

- Held Office Hours nine hours each week.
- Graded student submissions and tested homework pre-release.

Employment

Scientific Systems Inc. Co. July, 2021 – July, 2022
Autonomous Systems Coop *Woburn, MA*

- Created and prototyped an algorithm for UAVs to do multi-target pursuit tracking in an unstructured environment. This work was turned into the basis for a government contract.
- Researched modeling the large neighborhood search and tabu search algorithms for optimizing the Multi- Robot Task Allocation scheduling towards a given time horizon using Optaplanner.

United Electronics Industries July, 2020 – December, 2020
Sales Engineer Coop *Waltham, MA*

- Benchmark tested UEI's hardware to determine the max throughput.

BrainQ Technologies June, 2019 – August, 2019
Product Intern *Jerusalem, Israel*

- Improved EMG physical therapy product through testing and creating designs. Researched the start-up market to provide information for initiating Series B funding.

Robotics Projects

F1/10th Autonomous Racing Interschool Race: 1st Place
F1/10th Class Project *2024*

OWL 360: Observe Without Limits
Computer Vision Class Project *2023*

TRASH: Tandem Rover and Aerial Scrap Harvester
Capstone Project *2022*

Visual and Spectral Terrain Classification in Unstructured Multi-Class Environments
Contributor to IROS 2022 paper *2022*

Northeastern's NASA RASC-AL Challenge Club
Mobile Robotics Team Lead *2021-2022*

Hack the Normal Hackathon
SOAR *2021*

Extracurricular Activities

Jewish Student Union Club
Member *2020-Present*

Disability Resource Center
Notetaker for EE 2412 Fundamentals of Electronics *2020-2021*

Dialogue of Civilizations in Israel
Multiple Narratives and Cultural Complexities *2019*

Other Interests

Running
2024 and 2023 Philadelphia Marathon, 2022 Pisa Marathon *2020-Present*

Six-month backpacking trip in Southeast Asia
Thailand, Cambodia, Vietnam, Malaysia *2018*