Calder N. Robbins

(413) 992-8113 | robbins.cal@northeastern.edu | linkedin.com/in/calder-robbins | github.com/cnrobbins

Summary | PhD candidate with a background in biomechanics, neuromechanical simulation, and assistive robotics. I develop exoskeleton hardware and controllers, as well as simulation-based frameworks for the development of device design and adaptive control strategies to enhance the performance of assistive devices.

Education

Northeastern University
PhD in Mechanical Engineering
University of Massachusetts Amherst
MS in Mechanical Engineering — *GPA: 3.9*
BS in Biomedical Engineering | Cum laude — *GPA: 3.8*

Skills

Programming Python, MATLAB, Simulink
Modeling SolidWorks, MuJoCo
Experimental Motion Capture, EMG, OpenSim, MyoSuite
Manufacturing 3D Printing (FDM, SLA, SLS)
Design Adobe Suite

Publications

- Price, M., **Robbins, C.**, Szemethy, S., Abdikadirova, B., Olson, G., Hoogkamer, W., & Huber, M. E. (2025). *Adjustable Compliance Footwear Technology to Investigate Gait Adaptation*, IEEE Robotics and Automation Letters, doi: 10.1109/LRA.2025.3629969.
- **Robbins, C.***, Son, H.*, & Song, S. *MyoAssist 1.0: A MyoSuite module for simulating and training physical human–device interaction*. ***Manuscript in preparation***
- **Robbins, C.**, Grimmitt, A., Price, M., & Hoogkamer, H. *Effects of steep slopes and footwear bending stiffness on joint kinematics during walking*. ***Manuscript in preparation.***

Research Experience

NeuMove Lab — **Aug 2024 – Present**
Graduate Research Assistant, PhD Candidate — *Advisor: Seungmoon Song, Ph.D.*

- **Project Lead** on *MyoAssist*: An open-source platform for neuromechanical simulation and assistive robotics development.
- Modeled and integrated exoskeleton and prosthetic devices within the MyoSuite simulation suite, and developed a control optimization framework for devices.
- Presented a four-hour, hands-on tutorial workshop introducing *MyoAssist 1.0* at the 2025 *American Society of Biomechanics* meeting.
- Presented *MyoAssist 0.1: Myosuite for Dexterity and Agility in Bionic Humans* at the 2025 *International Conference On Rehabilitation Robotics (ICORR)*.
- Presented independent research on simulation-based exoskeleton control optimization at the 2025 *American Society of Biomechanics* meeting.
- Actively developing novel exoskeleton hardware in collaboration with Professor Max Shepherd.

Human Robot Systems Lab — **Feb 2022 – Aug 2024**
Research Assistant, Graduate Research Assistant — *Advisor: Meghan Huber, Ph.D.*

Variable Stiffness Shoes

- Co-developed pneumatic variable-stiffness footwear capable of independently modulating midsole compliance under each foot for gait perturbation experiments.
- Designed and manufactured a novel adjustable "air pocket" for sneaker outsoles.
- Prototyped advanced footwear technology (AFT) through various benchtop methods and manufacturing processes (FDM, SLS, SLA 3D printing).
- Led hardware characterization of stiffness, damping, and step-response behavior.
- Conducted pilot studies demonstrating asymmetric compliance perturbations during walking to study gait adaptation and motor learning.

General

- Assisted with a study on exoskeleton assistance entrainment.
- Wrote "air pocket" manufacturing guides and best practices.

UMass Integrative Locomotion Lab **Feb 2020 – Aug 2024**
Research Assistant, Graduate Research Assistant *Advisor: Wouter Hoogkamer, Ph.D.*

Uphill Biomechanics

- Designed and built a specialized uphill treadmill.
- Designed and ran a study on the effects of bending stiffness on the biomechanics of inclined walking.
- Wrote custom MATLAB and Python data processing and analysis pipelines.
- Presented work on steep-incline biomechanics at the 2024 *American Society of Biomechanics* meeting.

General

- Completed MATLAB data analysis for Asymmetrical footwear and split-belt running study of gait and balance for stroke and neuromuscular disease patient rehabilitation.
- Assisted with metabolic and biomechanics data collection for various studies.

Relevant Course Work

Human Movement Simulation **Fall 2025**
- Simulated variable-stiffness ankle prosthesis in MyoAssist with a co-evolutionary optimization framework to investigate how different gait cost priorities, such as metabolic effort, symmetry, and joint loading, shape personalized stiffness adaptation.

Wearable Robotics **Fall 2024**
- Implemented and compared CMA-ES and deep reinforcement learning frameworks in neuromechanical simulation to optimize bilateral ankle exoskeleton assistance.

Musculoskeletal Modeling and Simulation **Spring 2024**
- Simulated ankle exoskeleton in OpenSim Moco to assess the impact of post-stroke plantar flexion weakness on optimal assistance.

Human Robot Systems **Fall 2022**
- Simulated hip exoskeleton using OpenSim Moco to assess the impact of ground angle on optimal hip torque profiles during walking.
- Completed projects on optimal control, multi-DOF control and coordination, and impedance control.

Organizations

NEU MIE PhD Council | Member, Vice President **2024-Present**
- Organize and plan community building and outreach events for MIE PhD students, including seminars, networking events, and student-run activities.

UMass BME Diversity, Equity, & Inclusion Committee | Member **2021-2023**
- Help organize and plan community building and outreach events for the BME department.
- Awarded the ***Biomedical Engineering Departmental Impact Award***.

UMass Fencing | President, Captain **2019-2021, 2023-2024**
- Organized and managed team activities, practices, and finances.
- Wrote yearly budget requests and allocated funds accordingly.

UMass Club Sports Executive Board | President **2020-2021**
- Advised all of UMass club sports on finances, scheduling, and general conflicts.
- Attended both Student Government and Organizational meetings with university leadership.

Work Experience

Beaver-Visitec International (BVI Medical) **Summer 2023**
Research and Development Intern
- Completed Medical Device Regulation (MDR) technical documentation and DHF remediation for multiple device families.
- Completed design reviews and all supporting documentation (User Needs, Product Requirements, Product Requirement Derivation, Design Verification Master Plan and Protocol, and Test Methods) for multiple devices.
- Completed both User Failure Mode and Effects Analysis (UFMEA) and Design Failure Mode and Effects Analysis (DFMEA) for for multiple devices.
- Utilized 3D printing (FDM and SLS) to create fixtures and prototypes for device testing.

Pleasant Bay Community Boating **2019-2022**
Sailing and Adaptive Sailing Coordinator
- Accessible sailboat research, design, and construction for individuals with disabilities or limited mobility.
- Wrote sailing curriculum for a wide range of ages and skill levels.
- Managed a team of 20 sailing instructors.