

Kentaro Barhydt

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EDUCATION

Massachusetts Institute of Technology , Ph.D. in Mechanical Engineering <i>Karl H. Otto Fellow (2021-2022)</i>	Sep. 2021 - 2026 (expected)
Tufts University , M.S. in Mechanical Engineering	Sep. 2018 - May 2020
Union College , B.S. in Mechanical Engineering	Sep. 2014 - June 2018

PUBLICATIONS & REVIEWS

Publications:

- Y. Gao*, **K. Barhydt***, C. Niezrecki, Y. Gu, "Provably Stabilizing Global-Position Tracking Control for Hybrid Models of Multi-Domain Bipedal Walking via Multiple Lyapunov Analysis," *Journal of Dynamic Systems, Measurement and Control*, 2023. [accepted]
- **K. Barhydt** and H. H. Asada, "A High-Strength, Highly-Flexible Robotic Strap for Harnessing, Lifting, and Transferring Humans", *IEEE Robotics and Automation Letters (RA-L)*, 2023.
- **K. Barhydt**, A. Adu-Bredu, S. Everhart-Skeels, G. Bedell, K. Panetta and W. Messner, "Cartbot: A Direct-Manipulation Minimal Degrees-of-Freedom Mobile Assistive Robot to Maximize User Agency," 2020 IEEE International Conference on Human-Machine Systems (ICHMS), pp. 1-6, Rome, Italy, Sep. 2020.
- J. Kimber, Z. Ji, A. Petridou, T. Sipple, **K. Barhydt**, J. Boggs, L. Dosiek, and J. Rieffel, "Low-cost wireless modular soft tensegrity robots", *2019 2nd IEEE International Conference on Soft Robotics (RoboSoft)*, pp. 88-93, Apr. 2019.

Workshops:

- **K. Barhydt**, "Make a Robotic Strap: Strong yet flexible robots for lifting humans," *ACM DIS'23 Conference Workshop: Soft Robotics and Programmable Materials for Human-Computer Interaction*, July 20, 2023.

Reviewer: IEEE/ASME Transactions on Mechatronics (2023); IEEE/RSJ IROS (2022, 2021); IEEE ICRA (2021); IEEE Transactions on Systems, Man, and Cybernetics (2020, 2019)

RESEARCH EXPERIENCE

d'Arbeloff Lab, MIT, Cambridge, MA *Sept. 2021 – Present*
Graduate Research Assistant

- Researching design principles for novel robot morphologies and frameworks to advance the physical capabilities of robotic hardware for human-robot interaction.
- Ideated and formulated my Ph.D. research project idea on the investigation and development of a novel "Robotic Strap" manipulator concept for harnessing, lifting, and transferring humans.
- Developed the concept, design, and prototype for a novel "Robotic Strap" manipulator, resulting in the first successful demonstration of a robot safely harnessing and lifting humans above the ground.

Terrain Robotics Adv. Control & Experimentation Lab, UMass Lowell, Lowell, MA *Nov. 2020 – Aug. 2021*
Visiting Researcher

- Developed a novel trajectory tracking controller for multi-domain hybrid models of bipedal walking based on control Lyapunov functions and quadratic programming.
- Created custom simulation tools for the Digit humanoid robot platform using the MuJoCo physics library and C/C++.

Robot Locomotion and Biomechanics Lab, Tufts University, Medford, MA *Jan. 2020 – June 2020*
Graduate Research Assistant

- Developed a modular jumping robot test rig for spatially-constrained high-energy/velocity experiments in both natural and controlled environments.
- Established initial investigation and formulation of a milli-scale robotics project on morphological intelligence in foot design.

Prof. William Messner Research Group, Tufts University, Medford, MA *Sept. 2018 – May 2020*
Graduate Research Assistant

- Designed and developed a novel assistive robotic platform to help persons with high-level spinal cord injury (SCI) gain independence in performing activities of daily living in home environments.
- Formulated and implemented a minimal-DoF design approach for mobile manipulators to maximize the teleoperator's agency over the platform's operation through a direct-manipulation control scheme.
- Designed and conducted experimental user-studies involving participants with C4-C7 SCI to validate our design approach.

Evolutionary Robotics Group, Union College, Schenectady, NY *Feb. 2017 – June 2018*
Undergraduate Research Assistant

- Designed, manufactured, programmed, instrumented, and evaluated the first wireless vibrating tensegrity robot, to enable genetic algorithm experiments on rapidly fabricated physical platforms.
- Developed and experimentally tested a resonant model of single strut vibration.

GE Global Research, Niskayuna, NY *June 2016 – Jan. 2017*
Research and Development Intern

- Researched and synthesized cutting-edge VR/AR technologies for new applications in engineering design and manufacturing.
- Developed interactive VR simulations using Unity3D and C# to establish proof-of-concept demonstrations for client-relevant use cases.

LEADERSHIP EXPERIENCE

Mentor; MakerWorkshop, MIT, Cambridge, MA *Feb. 2023 – Present*

- Hold weekly shifts to supervise the shop and assist users on their projects, and run trainings on how to use the shop's measurement tools, including an Instron 5969 tensile testing machine.

Project Lead & Supervisor; TRACE Lab, UMass Lowell, Lowell, MA *March 2021 – Sept. 2021*

- Supervised two undergraduate students on a bipedal robot walking simulation project by administering trainings and delegating/managing their short- and long-term tasks.

Lab/Project Manager; Prof. Messner Research Group, Tufts University, Medford, MA *June 2019 – May 2020*

- Directed the lab's research directions, managed lab funding, and led 2-4 students working on our projects by delegating responsibilities and providing guidance both during and outside of lab meetings.

SKILLS AND COURSEWORK

Technical Skills: CAD, Python, MATLAB, mechatronics design & fabrication, pneumatics, metal machining, rapid manufacturing, Arduino, C/C++, MuJoCo, Blender, Unity3D, Adobe Premiere Pro

Graduate Coursework: **MIT:** Elements of Mechanical Design; Design of Compliant Mechanisms; Machines & Systems; Manufacturing Processes and Systems; Introduction to Robotics; Underactuated Robotics; and Learning; Advanced System Dynamics and Control
Tufts: Design of Physical Solutions for People in Need; Inventive Design; Socially Assistive Robotics; Biomechanics; Advanced Dynamics; Digital Control of Dynamic Systems; Numerical Methods; Bioinspired Robotics (ind. study)