

# Kentaro Barhydt

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## EDUCATION

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<b>Massachusetts Institute of Technology (MIT)</b> , Ph.D. in Mechanical Engineering <i>GPA: 5.0/5.0, Karl H. Otto Fellow (2021-2022)</i>	2026 (expected)
<b>Tufts University</b> , M.S. in Mechanical Engineering	May 2020
<b>Union College</b> , B.S. in Mechanical Engineering	June 2018

## PUBLICATIONS & REVIEWS

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### Publications:

- **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. [accepted]
- **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.
- **K. Barhydt**, "Development of a Fully Instrumented, Resonant Tensegrity Strut" (2018). *Honors Theses*. 1627.

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

## RESEARCH EXPERIENCE

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

- 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**

- Assisted the development of a novel trajectory tracking controller for multi-domain hybrid models of bipedal walking based on control Lyapunov functions and quadratic programming.
- Developed 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 for client-relevant use cases.

## **LEADERSHIP EXPERIENCE**

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**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**

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

**Relevant Graduate Coursework:** Elements of Mechanical Design, Introduction to Robotics, Manufacturing Processes and Systems, Identification Estimation and Learning, Advanced System Dynamics and Control, Bioinspired Robotics (ind. study), Design of Physical Solutions for People in Need, Biomechanics, Advanced Dynamics, Socially Assistive Robotics, Numerical Methods