

BENJAMIN BOKSER

[bbokser](#) | [ben-bokser](#) | [benbokser.com](#) | [bbokser@gmail.com](#) | [+1\(917\)376-6326](#)

EXPERIENCE

Graduate Student Researcher

Aug 2021 - Present

Robotic Exploration Lab, Carnegie Mellon University.

Pittsburgh, PA

- Mechanical, electrical, software, and controls lead on the REx Hopper, a monopod robot with reaction wheels.
- Performed iterative mechanical design from the initial concept to the final prototype.
- Derived force and position controllers for a five-bar linkage leg.
- Wrote a quaternion-based attitude controller for the reaction wheel array.
- Wrote and successfully tested a whole body model predictive control framework for the robot with a sinusoidal hopping trajectory in multiple simulation environments.
- Developed the robot's C++ software stack, which is currently being used for real-time control on the hardware.
- Designed a 48V power distribution PCB with pre-charging functionality.
- Increased the disturbance rejection and balancing capabilities of a Unitree A1 quadruped through the electromechanical design and fabrication of a reaction wheel control module.

Robotics/Mechatronics Research Engineer

Nov 2018 – Jan 2021, Jun 2021 – Aug 2021

Liberating Technologies, Inc.

Holliston, MA

- Designed and prototyped a novel prosthetic foot mechanism with which successfully adjusted for different ambulatory modes on human subjects. This design is now undergoing the patent application process.
- Developed CFRP springs and their compression mold tooling for the novel prosthetic foot and closely matched spring deflection targets (verified through both benchtop testing and subject feedback) using FEA.
- Designed a robotic prosthetic manipulator with improved adaptation to different grasp types at low cost and weight.
- Developed a powered prosthetic finger with a cable driven robotic gripper on the fingertip, through CAD and iterative prototyping. Optimized for injection molding and CNC machining as options for production.
- Designed a powered hand exoskeleton that returned hand function to human subjects, using kinematic analysis, 3D printing, and machining. In one case, a subject was able to tie their shoes after 3 years of inability to do so.
- Conceptualized and designed a robotic prosthetic hand with a novel belt driven differential mechanism.

Research Assistant

Jan 2018 – Jun 2018

Biomechatronics and Intelligent Robotics Lab, CCNY, CUNY.

New York, NY

- Designed a concept hip and back exoskeleton and co-wrote a corresponding proposal, which won the Toyota Mobility Challenge's \$50k Discovery Award.
- Designed an orthotic cable driven ankle exoskeleton.

Mechanical Engineer

Jan 2018 – Jun 2018

Neural Engineering Lab, Center for Discovery and Innovation, CCNY, CUNY.

New York, NY

- Designed and prototyped an ergonomic assisted mobility device, Toddler Cane, for vision-impaired children.
- Modeled and prototyped various custom 3D-printed tools for neuroscience research

Systems Engineering Intern

Jun 2017 - Aug 2017

Center for Applied Simulations and Analytics, The Boeing Company.

Huntsville, AL

- Developed an interface between MATLAB Simulink and an open-source flight simulator for software-in-the-loop verification and validation which executed in 25% as much time as a Boeing proprietary co-simulation program.
- Programmed and modeled an interface between an open source MATLAB black-box verification algorithm and a Simulink Real-Time target computer as a proof-of-concept for black-box verification.
- Designed and configured MATLAB Simulink models for black-box verification of airplane control systems.

EDUCATION

Master of Science in Mechanical Engineering, Carnegie Mellon University Dec 2022

Bachelor of Engineering in Mechanical Engineering, City College of New York Jun 2018

PUBLICATIONS

B. Bokser, K. Keough, A. Tazsreak, *et al.*, *Prosthetic foot with switchable walking and jogging modes*, US Patent App. 17/590,280, Aug. 2022.

C.-Y. Lee, S. Yang, B. Bokser, *et al.*, “Reaction wheel assisted locomotion for legged robots,” in *ICRA 2022*, 2022.

T. Farrell, B. Bokser, K. DiMatteo, *et al.*, “Evaluation of a novel active socket cooling system,” *Journal of Prosthetics and Orthotics*, vol. 32, 2020.

C. Martinez-Luna, B. Bokser, C. King, *et al.*, “Development and evaluation of pointdexter—an integrated prehensor for prosthetic fingers,” in *MEC20 Symposium*, 2020.

PROJECTS

Spryped: A Bipedal Robot with Impedance Control. Jan 2020 – July 2021
Programmed an 8 DOF serial bipedal robot to dynamically balance and walk in PyBullet through implementation of whole-body control and model predictive control.

Robojoey: A Vertically Constrained Monopod Hopper. Feb 2021 – May 2021
Demonstrated a correlation between increasing tendon length and efficiency in a successively hopping monopod robot. Won Best Overall Project award (2021) for 24-775 Robot Design and Experimentation at CMU.

SpryDrive: An Affordable, High-Torque Dynamic Actuator. Sep 2019 – Jan 2020
Developed an open-source PMSM quasi-direct drive actuator optimized for low profile, low weight, and low backlash.

Soft Knee Exoskeleton for Human Augmentation and Injury Prevention (Team Lead). Sep 2017 – May 2018
Developed a lightweight cable driven knee exoskeleton which won semifinalist for the Zahn Innovation Center’s Kaylie Hardware prize, Best Senior Design Award in ME, and Best Mechatronics Project Award (Spring 2018).

SKILLS

- | | | | | |
|---------------|------------------|-------------------|----------------|--------------------|
| • SolidWorks | • LaTeX | • Kinematics | • STM32 | • DFM |
| • Prototyping | • C & C++ | • Dynamics | • Raspberry Pi | • Gearbox Design |
| • Machining | • Python & Julia | • Optimal Control | • UP Xtreme | • Machine Learning |
| • GD&T | • ROS | • MuJoCo | • Arduino | • MATLAB |
| • FEA | • Git | • PyBullet | • PCB Design | • Simulink |