

Kevin J. McDonald, PhD

kevinjm@bu.edu • 774-452-6597 • www.kevinmcdonald.org

Summary

- Driven engineer with experience leading robot hardware projects from conception to multiple publications
- Expert in the design of soft robotic mechanisms using magnetorheological fluids
- Helped secure \$500,000 in grant money for a multi-year project and led a team to meet regular goals
- Five years as most senior student in lab, with experience mentoring younger and older students of all levels

Education

PhD in Mechanical Engineering	<i>Boston University</i>	GPA: 4.00	May 2023
MS in Mechanical Engineer	<i>Boston University</i>	GPA: 4.00	January 2022
BS in Mechanical Engineering	<i>Northeastern University</i>	GPA: 4.00	May 2018

Minors in Electrical Engineering and Mathematics

Academic Experience

Graduate Researcher in Morphable Biorobotics Lab, Boston University 2018–2023

Project Management

- Co-authored a grant application resulting in a \$500,000 award from the Office of Naval Research
- Organized and mentored PhD, masters, and undergraduate students on a project with diverse technical areas
- Led weekly technical meetings to direct progress toward ONR reports and publication goals

Research

- Developed new hardware for controlling pneumatic and hydraulic soft robots with smart fluids and magnets
- Integrated novel control hardware, sensors, and actuation mechanisms into multi-degree of freedom robots
- Disseminated research through publication in highly ranked journals
- Presented at top conferences including the International Conference on Robotics and Automation and the International Conference on Soft Robotics
- Constructed testing platforms for hardware validation using rapid prototyping of fixtures designed in SolidWorks and test code written in LabVIEW and Python
- Simulated mechanical and electromagnetic systems in COMSOL to inform design decisions
- Conducted extensive data analysis using MATLAB
- Visualized results via schematics designed in Adobe Illustrator and videos edited in Adobe Premiere

Lab Management

- Promoted an inclusive lab space that celebrated diversity of nationality, gender, and background
- Selected equipment and materials from external suppliers to furnish a new lab space
- Oversaw lab cleanliness and safety through role as Lab Safety Officer
- Trained students on lab processes and served as the lab expert on experiment design and equipment upkeep
- Provided technical expertise for projects in the lab and for collaborating groups

Selected Publications

- **K. J. McDonald**, L. Kinnicutt, A. M. Moran, and T. Ranzani, “Modulation of magnetorheological fluid flow in soft robots using electropermanent magnets,” *IEEE Robotics and Automation Letters*, Feb. 2022. Also presented at the *IEEE International Conference on Robotics and Automation*, May 2022
- **K. McDonald** and T. Ranzani, “Comparison Criteria for Hardware Methods for Onboard Control of Fluidically Actuated Soft Robots,” lightning talk at the New Directions for Simplified Control of Soft Robots workshop, *2022 IEEE International Conference on Soft Robotics (RoboSoft)*, Edinburgh, UK, April 4, 2022
- **K. McDonald** and T. Ranzani, “Hardware methods for onboard control of fluidically actuated soft robots,” *Frontiers in Robotics and AI*, vol. 8, pp. 1–19, Aug. 2021.
- **K. McDonald**, A. Rendos, S. Woodman, K. A. Brown, and T. Ranzani, “Magnetorheological fluid-based flow control for soft robots,” *Advanced Intelligent Systems*, vol. 2, no. 11, pp. 1–8, 2020.

Professional Experience

Boston Micromachines Corp., Cambridge, MA

July 2017 – December 2017

Mechanical Engineering Co-op

- Independently developed a package for a new MEMS deformable mirror for adaptive optics
- Designed PCBs and rigid-flex circuits to interface MEMS devices with high voltage drivers
- Designed metal fixtures for electron beam PVD and interfacing of MEMS mirror with optical testbeds
- Measured physical and electromechanical properties of untested MEMS die using interferometry
- Developed and tested wire bonding recipes for new MEMS product
- Troubleshooted and bug-tested proprietary software in Windows and Linux

The Charles Stark Draper Laboratory Inc., Cambridge, MA

July 2016 – December 2016

Microfabrication Process Engineering Co-op

- Collaborated on the development of proprietary high density microcircuits and other microelectronic devices
- Worked in several specialized labs, including Class 10, 100, and 1000 cleanrooms and static sensitive areas
- Programmed and operated manual and semi-automated measurement and production equipment
- Interfaced with technicians, inspectors, and engineers to discuss results of analyses with the goal of quality improvement and cost reduction
- Developed standard operating procedures for laboratory tasks including rapid thermal annealing and weekly maintenance tracking

Selected Technical Skills

- Design, fabrication, and testing of soft robotic actuators and sensors
- Synthesis, modeling, and applications of smart fluids, especially magnetorheological fluids, for developing novel actuators and sensors
- Experimental design including the development and troubleshooting of hardware test fixtures and control software in LabView and Python
- Data acquisition with Arduino, Raspberry Pi, and National Instruments DAQs
- Data analysis in MATLAB
- 3D design and rendering in Solidworks and Fusion360
- Rapid prototyping via additive manufacturing, laser cutting, and plastics processing
- Modeling and simulation of electromagnetic, mechanical, and fluidic systems via finite element analysis in COMSOL
- PCB design in Eagle
- Graphic design and figure preparation with Adobe Illustrator and Photoshop
- Video editing in Adobe Premiere

Hobbies

- Musician, record collector, jazz enthusiast
- Voracious reader, tea drinker, film watcher
- Gardener, cat lover
- Skier, kayaker
- Always yearning to learn something new