Michael Burgess

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Education

2023 - 2025 **Massachusetts Institute of Technology (MIT)** Cambridge, MA
M.S. in Mechanical Engineering GPA: 5.0 / 5.0
Advisor: Edward Adelson | Focus: Robotic Manipulation & Tactile Sensing

2018 - 2023 **Massachusetts Institute of Technology (MIT)** Cambridge, MA
B.S. in Mechanical Engineering GPA: 5.0 / 5.0
Courses: Underactuated Robotics, Generative AI, Nonlinear Control, Dynamics

Technical Skills

Software	*Concepts:*	Machine Learning, Computer Vision, Controls, RL, Algorithms, App Dev
	Languages:	Python, C++, C, MATLAB, ROS, Drake, Isaac Gym, JavaScript, TypeScript, React, TensorFlow, PyTorch, NumPy, Git, AWS
Hardware	*CAD:*	Solidworks, Autodesk, NX, ANSYS, Fluids, Statics, FEA / CFD Simulation
	Manufacturing:	CNC, Lathe, Waterjet, 3D Printing, Injection Molding, Wet Lab
	Electrical:	Arduino, Raspberry Pi, Circuit Analysis, Simulink, Soldering

Professional Experience

May 2024 - Aug. 2024 **Animo Robotics** / *Robotic Controls Engineer*
- Lead developer of a teleoperation system for novel robotic hardware at a stealth startup, enabling the execution of dynamic manipulation tasks from remote stations.
- Leveraged skills in robotic controls and user interface design to create this system.

May 2023 - Aug. 2023 **Commonwealth Fusion Systems** / *Mechanical Engineering Intern*
- Modeled parts for magnet subsystems on a novel tokamak fusion reactor using NX and ANSYS software. Specifically designed supports for poloidal field (PF) coils.
- Key takeaways from the internship were skills in electromechanical analysis, communication of results, and mechanical modeling techniques.

Jan. 2022 - May 2023 **MIT Biomimetic Robotics Lab** / *Undergraduate Researcher*
- Performed research on locomotive trajectory planning over non-flat terrain for a quadruped (cheetah-like) robotic system.
- Developed a novel controller that decouples kinematic and dynamic constraints to empower online planning over discrete uneven terrain.

May 2022 - Aug. 2022 **Markforged** / *Software Engineering Intern*
- Developed a simulated annealing-based algorithm to improve printer bed packing, thereby increasing number of parts per print. All code was written in Typescript.
- Learned soft skills through the responsibility of hosting meetings and presentations.

Jan. 2021 - May 2021 **NASA Langley Research Center** / *Engineering Intern*

- Optimized convolutional neural network (CNN) models to estimate where a fluid flow becomes turbulent along the surface of an airfoil.
- Incorporated these models into flight simulation CFD solvers for practical use in minimizing viscous drag for wing design.

Aug. 2020 - Jan. 2021 **Scientific Systems Company, Inc. (SSCI)** / *Robotics Intern*

- Designed and tested a role-specific control system for UAV fleet with behavior responsive to user input incentives.
- Researched and developed state-of-the-art attention-based, reinforcement learning (RL) models using OpenAI gyms, Tensorflow, and PyTorch.

May 2020 - Aug. 2020 **General Motors (GM)** / *Controls Engineering Intern*

- Automated suite of standardized hardware-in-the-loop test cases for engine controller software using tools in Python and dSpace.
- Built streamlined code libraries to locate and diagnose errors across cars' control communication infrastructure, written in C code.

Publications

[1] **Michael Burgess**, Jialiang Zhao. "Learning Object Compliance via Young's Modulus from Single Grasps with Camera-Based Tactile Sensors". In: *arXiv*:2406.15304 (2024). URL: https://arxiv.org/abs/2406.15304.

[2] **Michael Burgess**. "Decoupled Kinodynamic Planning for a Quadruped Robot over Complex Terrain". In: *MIT dSpace* (2023). URL: https://dspace.mit.edu/handle/1721.1/151851.

[3] Nicholas Ramirez, **Michael Burgess**. "Robotic Arm Manipulation to Perform Rock Skipping in Simulation". In: *arXiv*:2310.11599 (2023). URL: https://arxiv.org/pdf/2310.14492.pdf.

[4] **Michael Burgess**. "Hybrid Trajectory Optimization of Simple Skateboarding Tricks through Contact". In: *arXiv*:2310.11599 (2023). URL: https://arxiv.org/pdf/2310.11599.pdf.

Teaching

Sept. 2023 - Dec. 2023 **Robotic Manipulation** / *Teaching Assistant (TA)* Cambridge, MA

Massachusetts Institute of Technology (MIT)

- Assisted in teaching a graduate course on robotic manipulation in Fall 2023 alongside Prof. Russ Tedrake. Topics covered included motion planning, deep perception, robotic simulation, and more.
- Advised student final projects, created homeworks, and held office hours.

Jan. 2020 - Feb. 2020 **MIT Global Teaching Labs (GTL)** Rho, Italy

ITIS Stanislao Cannizzaro

- Spent a month in Rho, Italy teaching robotics concepts to high school students.
- Created and taught my own curriculum covering simple circuits and PID control systems, including lectures, exams, and experiments with Arduino / breadboarding.

Portfolio

Dec. 2022 **Rock Skipping Robot**

- Developed a control architecture and simulation environment to perform the task of rock skipping on a Kuka IIWA robot arm using Drake and Python.
- Project required knowledge in dynamic trajectory optimization, fluid physics modeling, and robotic simulation techniques.

Dec. 2022 **Hula Hooping Robot**

- Designed, built, and controlled a 2 DoF robot system that was capable of hula hooping, in order to study how humans are able to hula hoop most effectively.
- Project required use of Matlab, embedded controls, and hardware design.

May 2022 **Underactuated Skateboard Control System**

- Created a trajectory planner using non-linear hybrid dynamic trajectory optimization to perform skateboard tricks in an abstracted simulation.
- Project was developed using Drake and required knowledge of non-linear controls.

For my full portfolio, please visit my website at mburgjr.github.io/portfolio/.