




# Michael Burgess

 Website |  Email |  Portfolio |  LinkedIn |  GitHub |  Scholar

## Education

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2023 - 2025	<b>Massachusetts Institute of Technology (MIT)</b> M.S. in Mechanical Engineering Advisor: Edward Adelson   Focus: Robotic Manipulation & Tactile Sensing	Cambridge, MA GPA: 5.0 / 5.0
2018 - 2023	<b>Massachusetts Institute of Technology (MIT)</b> B.S. in Mechanical Engineering Courses: Underactuated Robotics, Generative AI, Nonlinear Control, Dynamics	Cambridge, MA GPA: 5.0 / 5.0

## Technical Skills

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<b>Software</b>	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
<b>Hardware</b>	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

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Sep. 2024 - Dec. 2024	<b>The AI Institute</b> / Research Intern <ul style="list-style-type: none"><li>- Worked alongside team members in developing a robust and agile manipulation hardware platform for dynamic, contact-rich manipulation tasks.</li><li>- Responsibilities included developing an efficient computer vision system to track a baseball in real-time via high-speed camera to catch the baseball on hardware.</li></ul>
May 2024 - Aug. 2024	<b>Animo Robotics</b> / Lead Robotic Controls Engineer <ul style="list-style-type: none"><li>- Lead developer of a teleoperation system for novel robotic hardware at a stealth startup, enabling the execution of dynamic manipulation tasks from remote stations.</li><li>- Leveraged skills in robotic controls and user interface design to create this system.</li></ul>
May 2023 - Aug. 2023	<b>Commonwealth Fusion Systems</b> / Mechanical Engineering Intern <ul style="list-style-type: none"><li>- Modeled parts for magnet subsystems on a novel tokamak fusion reactor using NX and ANSYS software. Specifically designed supports for poloidal field (PF) coils.</li><li>- Key takeaways from the internship were skills in electromechanical analysis, communication of results, and mechanical modeling techniques.</li></ul>
Jan. 2022 - May 2023	<b>MIT Biomimetic Robotics Lab</b> / Undergraduate Researcher <ul style="list-style-type: none"><li>- Performed research on locomotive trajectory planning over non-flat terrain for a quadruped (cheetah-like) robotic system.</li></ul>

- Developed a novel controller that decouples kinematic and dynamic constraints to empower online planning over discrete uneven terrain.
- May 2022 - **Markforged** / *Software Engineering Intern*
- Aug. 2022
  - 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 - **NASA Langley Research Center** / *Engineering Intern*
- May 2021
  - 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.
- May 2020 - **General Motors (GM)** / *Controls Engineering Intern*
- Aug. 2020
  - 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

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- [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

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- Sept. 2023 - **Robotic Manipulation** / *Teaching Assistant (TA)* Cambridge, MA
- Dec. 2023 *Massachusetts Institute of Technology (MIT)*
  - Assisted in teaching graduate course 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 - **MIT Global Teaching Labs (GTL)** Rho, Italy
- Feb. 2020 *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

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- 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/](https://mburgjr.github.io/portfolio/).