

# Taylor Howell

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CONTACT INFORMATION	Durand 032 Stanford University CA, 94305 USA	thowell@stanford.edu thowell.github.io +1 801 300 9431
EDUCATION	<b>Ph.D. Candidate, Mechanical Engineering</b> , Stanford University <b>Sept. 2017 - present</b> Qualifying Exams (complete): Automatic Controls, Robotics, Research Advisor: Zachary Manchester  <b>M.S., Mechanical Engineering</b> , Stanford University <b>June 2019</b> Automatic Controls, Robotics  <b>B.S., Mechanical Engineering</b> , University of Utah <b>Dec. 2016</b> Summa Cum Laude Capstone Project: Wireless Power for Aerial Robots	
RESEARCH	<b>Research Assistant</b> , Robotic Exploration Lab, Stanford University <b>May 2018–Present</b>  My research is focused on developing fast optimization tools for motion planning of robotic systems. Currently, I'm working on algorithms for robust feedback motion planning and a fast solver for contact-implicit trajectory optimization. Previously, I was co-leading development of <code>TrajectoryOptimization.jl</code> , an open-source Julia package for solving constrained trajectory optimization problems.  <b>Research Assistant</b> , Telerobotics Laboratory, University of Utah <b>Oct. 2015 - Dec. 2016</b>  I devised and implemented a control scheme to sort swarms of microrobots using rotating uniform magnetic fields for minimally invasive medical applications. This work included: applied physics, simulation, nonlinear optimization, fabrication of a scaled microrobot swarm, and writing C++ code to control a tri-axial Helmholtz-coil system.  <b>Research Assistant</b> , Utah Center of Excellence for Biomedical Microfluidics, University of Utah <b>Sept. 2014 - Oct. 2015</b>  I designed and built a forty-eight-syringe pump for a medical microfluidic system, developed standard operating procedures for a high-throughput drug screening and cytotoxicity evaluation system, and performed statistical analysis for ovarian-cancer cell experiments.	
EXPERIENCE	<b>Instructor</b> , GREAT Summer Camp, University of Utah <b>Jun. 2017 – Jul. 2017</b>  Led a teaching team of three and taught practical robotics and programming skills to elementary school students using the LEGO Mindstorm platform and developed projects and challenges for FLL skills, telerobotics, and kinetic-art themed weeks.  <b>Co-founder</b> , Cornaby-Howell LLC <b>Apr. 2015 – Oct. 2015</b>  I prototyped systems including: a touch-display module with GUI, Arduino C code, a lead-screw system, and syringe attachment modules for precision high-throughput syringe pumps. Designed schematics for patent application.	

**Front Desk Clerk**, Ramada Limited Draper

**Apr. 2013 – Aug. 2013**

Manager on duty: checked in and out guests, made reservations, and ran breakfast.

**Twisty Puzzle Designer**

**Aug. 2007 – Jan. 2011**

I designed and built twisty puzzles with selling prices ranging from \$25 - \$850. I exhibited my work at the community's premier international event, Dutch Cube Day, in 2008.

## PUBLICATIONS

1. **T. Howell**, Z. Manchester. Direct Policy Optimization. *Prepared for ICRA 2020*.
2. **T. Howell**, C. Fu, Z. Manchester. Contact-implicit Trajectory Optimization with Nonlinear Friction Cones. *In preparation for ICRA 2020*.
2. B. Jackson\*, **T. Howell**\*, K. Shah, M. Schwager, Z. Manchester. Scalable Cooperative Transport of Cable-Suspended Loads with UAVs using Distributed Trajectory Optimization. 2020. Robotics and Automation Letters.
3. **T. Howell**\*, B. Jackson\*, Z. Manchester. ALTRO: A Fast Solver for Constrained Trajectory Optimization. 2019. International Conference on Intelligent Robots and Systems. Macao, China.
4. **T. Howell**, B. Osting, J. Abbott. Sorting Rotating Micromachines By Variations in Their Magnetic Properties. 2018. Physical Review Applied.
5. J. Arellano, **T. Howell**, J. Gammon, S. Cho, M. Janat Amsbury, B. Gale. Use of a highly parallel Microfluidic Flow Cell Array to determine therapeutic drug dose response curves. 2017. Biomedical Microdevices.

## SKILLS

Julia, C++, Python, Matlab, R  
 $\LaTeX$ , Git, Linux, Solidworks, ROS, Adobe Premiere Pro, Adobe Illustrator  
 Mill, Lathe, Vacuum Forming, Laser Cutting, Mold Making and Casting, Metal Sheet Fabrication

## COMMUNITY OUTREACH

Co-organized Social Impact Night event at Stanford to connect social-impact focused students and entrepreneurs (Spring 2019).

Mentored three summer interns at the Telerobotics Laboratory and developed soft robots with potential as catheter tips that will increase insertion distance deep in the brain and other hard-to-reach locations in the body (June 2016 – August 2016).

Science-fair judge for local elementary school (May 2015).

## COURSEWORK AT STANFORD

Convex Optimization, Optimal Control, Nonlinear Control, Advanced Software Development, Engineering Design Optimization, State Estimation, Principles of Robotic Autonomy, Introduction to Mechatronics, Linear Dynamical Systems, Introduction to Robotics, Machine Learning, Decision

Making Under Uncertainty, Control Design Techniques, Advanced Robotic Manipulation, Advanced Feedback Control, Introduction to Optimization, Experimental Robotics, Multi-robot Systems

COURSEWORK AT  
UNIVERSITY OF  
UTAH      State Space Control, Design of Experiments, Introduction to Finite Element Method, Programming for Engineers

FELLOWSHIPS AND SCHOLARSHIPS	Stanford Graduate Fellowship	<b>2017 – 2018</b>
	University of Utah Undergraduate Research Opportunities Program Fellowship	<b>2016</b>
	The Boeing Company Scholarship	<b>2016</b>
	Shirley L. & Kathelyne O. Evans Endowed Scholarship	<b>2016</b>
	Big Ten+ Grad Expo travel scholarship	<b>2016</b>
	University of Utah Presidential Scholarship	<b>2013 – 2016</b>