

# Matthew Strong

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## EDUCATION

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### University of Colorado Boulder

*Bachelor of Science in Computer Science, Chinese Minor, 4.00 GPA*

Boulder, CO

*Aug. 2017 – May 2021*

## EXPERIENCE

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### Undergraduate Researcher - Roboskin

January 2020 – Present

*HIRO (Human Interaction and RObotics Group) Group, CU Boulder*

*Boulder, CO*

- Devised a kinematic calibration algorithm estimating the pose of a sensory skin on a robot.
- Outperformed current best methods via a four times increase in accuracy, and four times decrease in optimization time.
- Setup the core codebase for robotic manipulator control with Robot Operating System (ROS), both in simulation and on the physical robot.
- Devised a framework for filling the gray area in between avoidance and contact, informed by robotic skin for collaborative robotics, funded by an university research grant.
- **Mentors:** Caleb Escobedo, Kandai Watanabe, CS PhD students.

### Undergraduate Researcher - Efficient Hierarchical Reinforcement Learning June 2020 – June 2021

*HIRO Group, CU Boulder*

*Boulder, CO*

- Built on top of a state of the art Hierarchical Reinforcement Learning method (Data Efficient Hierarchical Reinforcement Learning) by improving training time to complete robotic locomotion tasks 2-4 times faster.
- Theoretically motivated entropy in HRL, empirically demonstrating more efficient learning.
- Developed and designed baseline HRL agent in a new RL Pytorch-based framework.
- **Mentor:** Kandai Watanabe, CS PhD student.

### Software Engineer Intern - Journey Optimization using RL

May 2020 – August 2020

*Microsoft, Customer Experience Platform (CXP)*

*Remote - Broomfield, CO*

- Worked on the CXP team, deploying a real-time analytics service for retrieving customer data.
- Finished original internship goals in half of the expected time, moving onto the creation of the AI service.
- Designed and developed a feature from scratch called journey optimization, which intelligently guides a customer through the "customer journey", using reinforcement learning.
- Worked with the AI team and researchers on which model to use, and how to integrate it, end-to-end.
- Used C#, .NET, Typescript, Azure DevOps.

### Undergraduate Researcher - Franka Panda Cartesian Control

September 2019 – December 2019

*HIRO Group, CU Boulder*

*Boulder, CO*

- Developed a ROS package that allows for Cartesian-based control of the Franka Panda, a 7 degree of freedom (DOF) robot arm.
- Integrated a state of the art inverse kinematics solver, Trac-IK (99.88 percent solve rate on the Panda), in C++.
- Devised a novel method for trajectory planning via a double Catmull-Rom Spline, using only joint positions.
- Validated on a real robot.
- **Mentor:** Chi-Ju Wu, MS Student, now at Zoox.

### Undergraduate Researcher - Energy Simulation via Machine Learning

January 2018 – present

*SBS (Sustainable Buildings and Societies) Lab, CU Boulder*

*Boulder, CO*

- Developed an automatic energy building simulation pipeline for testing energy usage of different building models.
- Integrated ML algorithms to avoid using expensive energy simulations.
- Wrote Ruby code for different measures to apply to simulated buildings.
- **Mentors:** Yunyang Ye, Yingli Lou, Civil Engineering PhD students.

### Undergraduate Researcher - Fast Airflow Simulation Using HPC

August 2020 – December 2020

*SBS Lab, CU Boulder*

*Boulder, CO*

- Designed and developed pipeline for testing Indoor Airflow simulations on HPC (high performance computing) within the CU Supercomputer ecosystem.

- Integrated simulation code to work on both GPU-based and CPU-based clusters.
- **Mentor:** Cary Faulkner, Civil Engineering PhD student.

## **CTO and Co-Founder - Udana Systems**

February 2018 – May 2020

*Udana Systems*

*Boulder, CO*

- Co-Founded company targeted towards drone delivery for small to medium sized businesses.
- Designed and developed robotics tech stack, using ROS, MavROS, Gazebo, PyTorch, and more.
- Developed machine learning pipeline for computer vision based models.

## **Software Engineer Intern - Global Search**

May 2019 – July 2019

*Microsoft, Dynamics 365 for Talent*

*Redmond, WA*

- Designed and developed the Global Search feature for Microsoft Dynamics 365 for Talent.
- Worked with .NET, Angular, and XML in order to successfully deploy an end-to-end feature.

## **AWARDS**

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### **RSS Inclusion Fellow**

June 2021

- Accepted as an RSS (Robotics: Science and Systems) Inclusion Fellow, which is a program intended to help strong, upcoming robotics researchers to actively participate in the one of the world's top robotics conferences, RSS.

### **Chancellor's Recognition Award**

May 2021

- An award given to students that maintain a 4.0 GPA throughout all of college.

### **Active Learning Award**

April 2021

- The Active Learning Award recognizes participation in three different kinds of hands-on learning experiences: discovery, service, and professional learning.

### **College of Arts and Sciences: Class of 2021 Amazing Student**

April 2021

- For my minor in Chinese, I received an outstanding student award for the Class of 2021 in the College of Arts of Arts and Sciences.

### **College of Engineering Research Award**

April 2021

- Received the College of Engineering Research Award. Only one other CS student from CU has received this award its 20+ year history.

### **CRA Outstanding Undergraduate Researchers 2021 – Honorable Mention**

December 2020

- Received honorable mention for the CRA Outstanding Researchers award, the most prestigious award for CS undergraduate researchers in all of North America.

### **UROP Research Grant: Null Space Control for Collaborative Robotics**

August 2020 – Present

- Received \$1500 research grant from CU Boulder's Undergraduate Research Opportunities Program (UROP) to perform research on null space control.

### **Sewall Scholar**

August 2017 – Present

- The top merit scholarship at CU Boulder.

### **Engineering Merit Scholarship**

August 2017 – Present

- Received based on high school academic performance.

### **BOLD Scholarship**

August 2017 – Present

- Received diversity scholarship based on high school achievement.

### **National Merit Scholar**

August 2017

- Selected to receive National Merit Scholarship on basis of outstanding high school achievement.
- Given to <1% of high school seniors in the US.

## PUBLICATIONS

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### **Evaluating Performance of Different Generative Adversarial Networks for Building Power Demand Prediction at a Large Scale**

*Applied Energy. In Progress.*

Yunyang Ye, **Matthew Strong**, Yingli Lou, Wangda Zuo.

### **Self-Contained Kinematic Calibration of a Novel Whole-Body Artificial Skin for Collaborative Robotics**

*International Conference on Robotics and Systems 2021. Accepted.*

Caleb Escobedo, **Matthew Strong**, Mary West, Ander Aramburu, Alessandro Roncone.

### **Self-Contained Kinematic Calibration of a Novel Whole-Body Artificial Skin for Collaborative Robotics**

*International Conference on Robotics and Systems 2021. Accepted.*

Kandai Watanabe, **Matthew Strong**, Mary West, Caleb Escobedo, Ander Aramburu, Krishna Chaitanya, Alessandro Roncone.

### **Enabling Close Proximity Human Robot Collaboration via Distributed, Self-Calibrating Robotic Skin**

*BS Thesis at CU Boulder. Committee: Alessandro Roncone, Bradley Hayes, Christoffer Heckman*

Matthew Strong.

### **Development of New Baseline Models for U.S. Medium Office Buildings Based on Commercial Buildings Energy Consumption Survey Data**

*Science and Technology for the Built Environment Volume 26, 2020. Accepted.*

Yunyang Ye, Yingli Lou, **Matthew Strong**, Satish Upadhyaya, Gang Wang, Wangda Zuo.

## SERVICE/LEADERSHIP

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### **HackCU**

August 2018 – Present

- Led HackCU's tech team, organizing the largest hackathon in the Rocky Mountain region.
- Managed whole tech stack during 500+ person hackathon.
- Developed hacker sites and APIs accessed by thousands of people across the nation and globe.
- Handled 1000+ hacker applications.
- Currently serving as technical advisor.

### **Slingshot Tutor and Founding Member**

June 2020 – Present

- Serving as a founding mentor for students from top high schools interested in CS at Slingshot, a startup co-founded by students from top tech companies.
- Conducting technical, coding interviews for top tier high school students in the world for entry into the program.
- Helped grow community to 1000+ members across the globe.

### **High School CS Tutor**

June 2020 – December 2020

- Tutoring a student from Legacy High School on a full-stack web app.
- Supervising the development of a chat app using React and .NET.

### **Discrete Structures Tutor**

January 2019 – May 2019

- Mentored student in discrete structures.
- Set homework and test-prep deadlines, and prepared practice problems.

### **SASE (Society of Asian Scientists and Engineers) Leadership**

January 2018 – May 2018

- Served as Co-Marketing Director and managed social media pages.

## MEMBERSHIP

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<b>Colorado Data Science Team</b>	August 2019 – Present
<b>SHPE (Society of Hispanic Professional Engineers)</b>	August 2019 – Present
<b>SASE (Society of Asian Scientists and Engineers)</b>	August 2017 – August 2019