# Trevor Matthews

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## Overview

Motivated Master's student in Mechanical and Aerospace Engineering at the University of California, San Diego, conducting research under the supervision of Prof. Sylvia Herbert. I am seeking Ph.D. positions in robotics and control, with a focus on safe, data-driven control of autonomous systems. My research interests include control barrier functions, reachability analysis, and learning-based methods for guaranteeing safety in uncertain and dynamic environments.

## Experience

**Safe Autonomous Systems Lab [🌐]** *September 2024 - Present*
*UCSD Graduate Research Assistant* La Jolla, CA
- Research focused on data-driven methods for ensuring safe and robust operation of autonomous vehicles in unknown environments.
- Implemented control-theoretic algorithms on hardware platforms for single- and multi-agent systems operating in dynamic, uncertain environments.

**Leidos LLC [🌐]** *December 2023 - Present*
*Mechanical Engineering Intern* La Jolla, CA
- Sole operator of a microfabrication SLA printer with 1,000+ hours of setup, maintenance, and production, fabricating over 1,000 precision parts.
- Designed and fabricated custom fixtures to support testing and development of micro-scale electronics for seamless integration into textiles.

**Morimoto Lab [🌐]** *May 2023 - June 2024*
*UCSD Undergraduate Research Assistant* La Jolla, CA
- Developed a rapid fabrication method for the vine component of Vine Robots with varying diameters, reducing production time from several hours to just 10 minutes.
- Adapted and manufactured a catheter actuation system enabling simultaneous translation of a catheter and telescoping working channel for a next-generation Vine Robot.

**Frazier Research Group [🌐]** *March 2023 - July 2023*
*UCSD Undergraduate Research Assistant* La Jolla, CA
- Designed a stackable, modular system to demonstrate the concept and utility of multi-stability in meta-materials.
- Led fabrication and implementation of a large interconnected system comprising 100 3D-printed modules.

## Education

**University of California San Diego** *Sep 2024 - June 2026*
*Masters of Science Engineering Sciences (Controls and Mechatronics)* La Jolla, CA
- GPA: 3.855/4.000

**University of California San Diego** *Sep 2020 - June 2024*
*Bachelors of Science Mechanical Engineering with a Specialization in Controls and Robotics* La Jolla, CA
- GPA: 3.936/4.000

## Projects

**Expanding Safe Sets with Learning-Based Barrier Functions and Reachability:** *April 2025 - Sep 2025*
*Tools: Python, ROS1, ROS2, JAX* [🐙]
- Developed data-driven approach to construct and adapt a control-bounded safety filter online for dynamic systems operating under uncertainty.
- Implemented novel software in both simulation and hardware, demonstrating provably safe control with in-loop perception and planning.

**Multi-agent Robotic Platform:** *December 2024 - February 2025*
*Tools: Python, ROS1, ROS2*
- Developed a robust and user-friendly multi-agent robotic platform, utilizing ROS 1 and ROS 2 to command up to 5 turtle-bots simultaneously
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**Method for Microfluidic Chip Fabrication for Single-Cell Interaction:** *February 2024 - June 2024*
*Tools: MATLAB, ANSYS Fluent, 3D Printing, Laser Cutting* [🌐]

- Development and design of a high-throughput, high-efficiency microfluidic chip capable of isolating single-cell interactions and is compatible with super resolution instruments.
- Fabricated and designed 10x scale of prototype designs using polyjet printing, resulting in a 70% capture rate.
- Oversaw planning, scheduling, and resource allocation for a $2,500 budget project, ensuring timely completion.

## Teaching Experience

**MAE 143B: Linear Control**, UC San Diego — *Course Grader* (Spring 2024)

## Patents and Publications

C=Conference, J=Journal, P=Patent, S=In Submission, T=Thesis

**[S.1]** Matthews, Trevor, et al. (2025). **Expanding Safe Sets with Learning-Based Barrier Functions and Reachability**. Manuscript submitted for publication in *IEEE International Conference on Robotics and Automation [ICRA]*.

**[P.1]** Trevor Matthews, Conor Archdeacon, Ben Croker, et al. (2025). **Method for Microfluidic Chip Fabrication for Single-Cell Interaction**. In Review

## Skills

- **Programming Languages:** MATLAB, Python, Arduino
- **Robotics and Learning:** ROS1, ROS2, JAX, Pytorch,l Linux Operating System
- **Design and Prototyping:** Solidworks, Fusion360, 3D Printing (FDM, SLA, PolyJet), CNC Machining, Manual Machining, ANSYS, Laser Cutting, Raspberry Pi
- **Documentation:** Microsoft Office, Google Suite, LaTeX, Notion

## Honors and Awards

**Best Senior Capstone Project - Runner Up** *June 2024*
*UC San Diego Department of Mechanical and Aerospace Engineering* [🌐]
- Chosen from among faculty and industry leaders as the runner up among 55 total projects presented. They judged based on rigor and impact of the project and quality of the poster presentation and final report.

## Leadership Experience

**Vice President - Finance** *March 2023 - June 2024*
*Tau Beta Pi Engineering Honors Society*
- Managed a $25,000 annual budget supporting 120+ events throughout the school year.
- Mentored the incoming VP-Finance and co-led a fundraiser that generated $200 for service and volunteer initiatives.

## Volunteer Experience

**Tau Beta Pi** *December 2022 - Present*
*Tau Beta Pi*
- Organized and participated in STEM outreach events in collaboration with Nova Spero at local elementary schools, including demonstrations and activities such as toothpick bridge building and DIY motor construction
- Led professional enrichment activities including resume workshops, technical interviews, and faculty and industry mixers for incoming and current members.

**Boy Scouts of America** *Sep 2016 - Present*
*Boy Scouts of America*
- Organized and executed project removing debris and landscaping the front planters of a local theater, increasing the appeal of the building while reducing injury risk and maintenance costs
- Over 400 hours of community service, including local elementary school outreach, cleaning and maintaining local church and community spaces, and support at community events and ceremonies.

## Professional Memberships

**Tau Beta Pi**, Membership ID: 218-01792-1 *January 2023 - Present*
**IEEE**, Membership ID: XXXXXXXX *Month Year - Present*

## Certifications

**Active Security Clearance: Top Secret** *June 2024*