

# Ryan Teoh

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## EDUCATION

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### University of California, Los Angeles

B.S., Aerospace Engineering – GPA 3.93

Expected Grad June 2026

Minor in Data Science Engineering, Technical Breadth in Electrical and Computer Engineering

## RESEARCH EXPERIENCE

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### Safe Autonomous Systems Lab (UCSD) PI: Dr. Sylvia Herbert

*Autonomy Researcher*

June 2025 – Present

- Built a real-time safety assurance module for autonomous agents by training a deep neural network to approximate Hamilton-Jacobi (HJ) reachable sets using supervision from a robust MPC controller.
- Integrated physics-informed learning with robust MPC to create a real-time safety certification framework resilient to adversarial disturbances and dynamic agents
- Deployed autonomy stack on ROS-based platforms (Turtlebots, quadcopters, and humanoids), validating control performance and safety margins in hardware-in-the-loop flight tests and multi-agent interaction scenarios.
- Achieved 98.6% boundary classification accuracy and  $<0.03\%$  deviation from dynamic programming ground truth, demonstrating strong alignment with formal safety guarantees.

### SOFIA Laboratory (UCLA) PI: Dr. Jeff Eldredge

*AI + ML and Controls Researcher*

October 2024 – Present

- Created and trained deep reinforcement learning agent using TD3 that creates control algorithms for wind turbine blades to extract maximum power from any type of flow field, regardless of turbulence or disturbances such as gusts
- Developed machine learning models (autoencoder/decoder, LSTM) in Python using PyTorch to compress flow fields into latent space and predict how vorticity fields develop over time
- Compared deep reinforcement learning techniques with traditional control algorithms for control of airfoils (maximizing lift, power, and other important coefficients)
- Compiled and ran computational fluid dynamics simulations with Julia Lang through Jupyter Notebooks to investigate influence of gusts and other disturbances on cyclists, and how to minimize sources of drag

### Nano Transport Research Group (UCLA) PI: Dr. Tim Fisher

*Research Associate*

October 2022 – June 2024

- Performed experiments and collected data using LabVIEW to develop and refine new technique of manufacturing carbon fiber using solar energy
- Analyzed and conducted structural analysis tests of carbon fiber samples to verify structural integrity and compare to current manufactured carbon fiber
- Collected and studied mass spectroscopy data and inverse flux mapping to explore effect of wattage on carbon deposition

## PUBLICATIONS, PRESENTATIONS, AND ABSTRACTS

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1. **R. Teoh**, S. Tonkens, W. Sharpless, A. Yang, Z. Feng, S. Bansal & S. Herbert. (2025). *MADR: MPC-guided Adversarial DeepReach*. Under review for **IEEE International Conference on Robotics and Automation (ICRA) 2026**.  
– Developed a novel learning framework combining robust MPC with Hamilton-Jacobi reachability to generate safe control policies and safety value functions for autonomous systems operating in adversarial environments.
2. **R. Teoh**, S. Tonkens, W. Sharpless & S. Herbert. (2025). *Robust Hamilton-Jacobi Reachability Learning via Adversarial Model Predictive Control Guidance*. Oral presentation, **UCSD Summer Research Conference**, 10-minute invited talk.  
– Demonstrated simulation and hardware experiments of novel method of generating safe control policies and safety value functions for pursuit evasion games in autonomous systems.
3. **R. Teoh**, Z. Liu & J. Eldredge. (2025). *Use of Deep Reinforcement Learning in Flow Control for Renewable Energy Applications*. To be submitted to **Renewable Energy** (Impact Factor: 9.1).  
– Applied Deep RL techniques to optimize flow control in fluid-structure systems to enhance renewable energy harvesting.
4. **R. Teoh**, Z. Liu & J. Eldredge. (2025). *Deep Reinforcement Learning Control of an Oscillating Hydrofoil to Maximize Power Extraction*. Oral presentation, **SoCal Fluids Conference**, 20-minute invited talk.  
– Demonstrated real-time DRL-based control strategies for maximizing energy output in oscillating hydrofoils.
5. **R. Teoh**, Z. Liu & J. Eldredge. (2025). *Deep Reinforcement Learning Control of an Oscillating Hydrofoil to Maximize Power Extraction*. Poster presentation, **UC LEADS Symposium**.  
– Presented early-stage results on leveraging deep RL for energy-efficient control in bio-inspired hydrofoil systems.

## WORK EXPERIENCE

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### General Atomics

#### *Systems & Software Engineering Intern*

June 2024 – September 2024

- Built app to visualize UAV documentation (schematics, diagrams, functional breakdown) utilizing JavaScript and automated python scripts, saving engineers 100s of hours by unifying documentation across 4 software programs under a single app
- Created interactive 3D model of UAV platform with component and subsystem breakdown to showcase to customers capability and operation, aiding in securing contracts
- Integrated checklist walkthrough for flight test engineers to follow using interactive 3D model and instructions to simplify testing procedures and data logging

### NASA Aeronautics Research Institute

#### *Aerospace Engineering Intern & Technical Lead*

June 2023 – August 2023

- Created and iterated on UAV platform design for use in medical supply delivery utilizing SolidWorks 3d modeling
- Performed structural analysis on drone design in Ansys, verifying ability to carry payload and structural integrity for high altitude flight
- Scrutinized aerodynamic properties of drone design using STAR-CCM+ to optimize in air maneuverability and maximize flight time
- Published research paper detailing viability of UAV platform usage in low-income countries (Ghana, Rwanda, etc.)

## ENGINEERING INITIATIVE

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**Mech/Aero Capstone Project – Autonomous Drone Racing** *Controls Lead* January 2025 – June 2025

- Developed hybrid control framework for racing quadrotor using nonlinear quaternion-based feedforward-feedback PD controller and reinforcement learning in custom Gym environment
- Designed and implemented a nonlinear quaternion-based PD controller with combined feedforward and feedback terms for robust trajectory tracking
- Created pretraining pipeline for TD3 reinforcement learning agent using traditional controller, accelerating convergence and enabling agent to learn new policy that outperformed baseline by 5% in tracking accuracy and stability
- Demonstrated policy generalization to unseen trajectories, achieving performance on par with classical control under varying conditions

**UCLA Engineering Internship and Research Program** *Peer Advisor* March 2025 – Present

- Advised fellow engineering students on research, internship, and full-time opportunities to increase recruitment and participation
- Created and distributed weekly internship and research newsletters reaching over 3,700 students
- Organized career development events and partnered with industry representatives to host info sessions and recruitment activities

**Tau Beta Pi** *Academic Outreach Officer* January 2023 – Present

- Provide tutoring for core engineering courses and organize midterm and final exam review sessions to support student academic success

**Bruin Formula One** *Aerodynamics/Composites* September 2022 – September 2025

- Researched, modeled, and simulated aerodynamic components (e.g., barge boards, airfoils, underbelly) using Star CCM to optimize downforce and minimize drag
- Fabricated composite and aerodynamic parts by laying up carbon fiber, machining frames, and sanding molds
- Manufactured structural elements by drilling, grinding, bending sheet metal, and cutting steel supports for the car frame

**SMART Project** *Software Lead* November 2022 – July 2024

- Led software team to research and implement Python/JavaScript data visualization libraries to display real-time data from surface magnetometers on SMART website
- Wrote Python scripts to facilitate data collection, compilation, transmission (e.g. uploading to Google Cloud), and visualization on Raspberry Pi control stations for 14 magnetometers deployed across US

## HONORS & AWARDS

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UC LEADs Scholar, Amazon AWS InCommunities Scholar, Chi Am Circle Scholar, Dean's Honor List, National Merit Finalist, HS Salutatorian, Tau Beta Pi Officer, Alpha Phi Omega

## SKILLS

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**Code Development:** Java, Git, Github, ReactJS, Android Studio, Javascript, HTML, CSS, C, C++, g++, Linux, Python, SVN, Docker, SQL, PyTorch, TensorFlow, Pandas, Julia Lang, Jupyter Notebooks, ROS, Weights and Biases

**Engineering Tools:** Labview, NumPy, Matplotlib, Matlab, Simulink, Solidworks, AutoCAD, LaTeX, Star-CCM, Ansys Workbench, Lathe, Bend machine, Jira, Confluence, SysML, MagicDraw, Blender