

Brendan Rudberg

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PROFESSIONAL SUMMARY

Mechanical engineering and robotics student at Caltech (4.0 GPA) who applies a deep hardware understanding to control and robotics software development. Experience spanning optomechanical hardware, mechatronics, autonomous robotics, and flight dynamics, now extending into state space and black-box modeling through a fellowship in Iceland.

EDUCATION

California Institute of Technology (Caltech)

BS in Mechanical Engineering, Minor in Robotics, Controls Focus; GPA: 4.0

Pasadena, California

Sep. 2024 - June 2028

Relevant Coursework: Robotics (ME/EE/CS 133, 129, 8), Design & Fab (ME 14), Dynamics, Applied Math (ACM 95)

Athletics: Caltech Track & Field (NCAA Division III) – Pole Vault School Record Holder; NCAA All-Academic Awardee.

EXPERIENCE

Stochastic SSM Research

Researcher

Reykjavik, Iceland

Jun. 2026 - Present

- **Continuous Time Stochastic Modeling:** Implementing CTSM on increasingly complex gray-box RC models of a dataset harvested from four DS18B20 temperature sensors using a Raspberry Pi 4.
- **Model Collation:** Benchmarking gray-box models against baselines and black-box approaches (LSTM, Mamba, S4)

Caltech Racing (Formula SAE)

Team President

Pasadena, California

Jan. 2026 - Present

- **Team Leadership:** Managing 8 subteam leads, leading team meetings, and owning system-level design decisions.
- **Safety-Critical HV Enclosure:** Houses a fault-reset PCB, shutdown buttons, master switches, and system voltage measurement points, balancing 400V isolation against externally accessible controls within a compact volume.

LiDAR Miniaturization Research (UW Lab of Photonic Systems)

Caltech Summer Undergraduate Research Fellow

Seattle, Washington

Jun. 2025 - Oct. 2025

- **Hardware Design and Characterization:** Designed and characterized PIC-based beam-steering laser hardware with a novel fabrication approach, reducing footprint 84% and improving reflectance 3× over a published baseline.
- **Cooling Loop Integration:** TEC controller, custom heatsink, and thermistor, stabilizing laser system to $\pm 0.01^\circ \text{C}$.

PROJECTS

Daedalus 3 Dynamics and Controls (PARSEC Rocketry)

Project

Pasadena, California

July 2026 - Present

- **Nonlinear Dynamics Modeling:** Derived a 4-state nonlinear coupled dynamics model of a bellyflop-to-vertical descent for a single-fan (in-development) drone, with flap and body aerodynamic forces driving translation and rotation; identified terminal velocity as the primary design driver setting the flap-sizing objective.
- **Nested Design Optimization:** Built a nested optimization in Python (SciPy) sweeping flap hardware parameters around an inner control-schedule tuning loop, integrating vehicle dynamics via segmented `solve_ivp` calls.

Inverted Pendulum on a Cart (ME 14)

Team Lead - Academic Project

Pasadena, California

May 2026 - June 2026

- **System Architecture and Hardware:** Led a 6-person team to design and integrate an inverted pendulum on a cart: owned hardware integration and the \$300 BOM across encoders, a driven cart, and electromechanical stack.
- **Control and State Estimation:** Architected the controls stack, built a Kalman filter for state estimation, and validated and tuned LQR for balancing and nonlinear Åström-Furuta swing-up in hardware.

Autonomous Exploration Robot (ME/CS 129)

Academic Project

Pasadena, California

Apr. 2026 - June 2026

- **Autonomous Navigation:** Implemented Dijkstra-based planning for autonomous maze exploration and goal-seeking, with continual replanning around dynamic obstacles and multithreaded any-time user interruption.
- **Multi-Sensor Control:** Fused ultrasonic, infrared, NFC, and gyroscope inputs for obstacle avoidance, wall-following, and localization, with tuned proportional control for stable real-time execution.

SKILLS

Software and Languages: SolidWorks, Onshape, ROS 2, Python, MATLAB, Simulink, C++, HTML (Astro), Linux

Equipment: Manual and CNC Mill, Lathe, Waterjet, Laser Cutter, 3D Printer, Bandsaw, Micrometer, Oscilloscope, OSA

Other: LQR, LQE, PID, Kinematics, IK, State Estimation, System Identification, Signal Processing, GD&T, TIG Welding