

# Max Freeman

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## Education

### University of California, Berkeley

Master of Engineering in Mechanical Engineering, Concentration in Controls & Robotics

August 2024 - May 2025

GPA: 3.98

### Cornell University

Bachelor of Science in Mechanical Engineering

September 2020 - May 2024

GPA: 3.77 | Magna Cum Laude

## Skills

**Hardware:** Mechatronics | Mechanical Design | 3D Printing | Rapid Prototyping | Arduino | Raspberry Pi

**Robotics:** Feedback Control | State Estimation | ROS | Model Predictive Control | Embedded Systems | Optimization

**Programming Languages:** Python | C++ | MATLAB

**Software & Tools:** Simulink | SolidWorks | Fusion 360 | Asana | Pyomo

**Leadership:** Project Management | Stakeholder Engagement | Agile Development | Risk Management | BOMs

## Highlighted Experience & Projects

### Project Lead, Multimodal Autonomous Platform Design (MEng Capstone)

September 2024 - Present

- Lead a team of four engineers to develop a multimodal vehicle capable of terrestrial and aerial locomotion.
- Integrate power supplies, actuators, and sensors with an NVIDIA Jetson, ensuring compatibility across components and enabling communication via ROS for real-time control.
- Coordinate development across three development streams, including mechanical design, flight control, and autonomous driving, managing dependencies between project tasks to keep key milestones on track.
- Develop and implement a custom MPC controller and physics-based simulator for an autonomous four-wheel skid-steer robot, enabling real-time path tracking and obstacle avoidance.

### Mechanical Design Intern, Lit Motors

June 2024 - July 2024

- Collaborated with cross-functional teams in a fast-paced startup to develop a novel two-wheeled EV.
- Designed a custom dual-plane dynamic balancing rig for Control Moment Gyroscopes using SolidWorks, providing a crucial testing platform to reduce vibrations and improve the operational stability of the CMG.
- Iterated on designs for the vehicle steering system in SolidWorks, improving chassis integration and reducing manufacturing complexity.
- Authored comprehensive system requirements documentation, enhancing alignment between teams.

### Fast Robots Project, Cornell University

January 2024 - May 2024

- Built a dynamic autonomous robot on an RC car platform, taking ownership of the development of the entire system, including hardware integration, soldering, and software engineering in C++ and Python.
- Integrated Time-of-Flight and IMU sensors using I2C, applying sensor fusion techniques and software-based filters in C++ to minimize sensor output noise by over 50%, enhancing system performance and reliability.
- Implemented and tuned distance-based PID controllers, reducing settling time by 40%.
- Debugged hardware-software interactions, ensuring reliable sensor data flow and minimizing latency.

## Additional Experience

### Control of Autonomous Flight Project, University of California, Berkeley

September 2024 - December 2024

- Developed a flight controller from scratch in C++ for the Crazyflie 2.0 quadcopter, achieving precise attitude control and horizontal and vertical translation.
- Implemented models for estimators and correctors, utilizing data from optical flow, IMU, and Time-of-Flight sensors to improve sensor data accuracy and provide precise feedback for control.

### Lead Engineer, Magnus Ultralight Drone Research, Cornell University

August 2023 - May 2024

- Organized project timelines and a \$2,000 budget, reprioritizing tasks to mitigate supply chain delays and keep development on time and within budget.
- Designed and optimized a cylindrical rotating cockpit for the prototype using MATLAB, achieving a 20% increase in lift-to-weight ratio while ensuring flight stability and handling requirements were maintained.
- Conducted post-flight diagnostics, testing sensor functionality and communication to identify system faults, repair damage, and enhance flight reliability.