Max Freeman

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Education

University of California, Berkeley **May 2025**
Master of Engineering in Mechanical Engineering, *Concentration in Controls & Robotics* GPA: 3.98

Cornell University **May 2024**
Bachelor of Science in Mechanical Engineering GPA: 3.77 | *Magna Cum Laude*

Skills

Robotics: ROS2 | Feedback Control | State Estimation | Embedded Systems | Model Predictive Control | CAN Bus
Hardware: Mechatronics | System Integration | Mechanical Design | Prototyping & 3D Printing | Root Cause Analysis
Programming Languages: Python | C++ | MATLAB
Software & Tools: SolidWorks | Fusion 360 | GitHub | Simulink | Asana | Pyomo
Leadership: Project Management | Cross-Functional Collaboration | Stakeholder Engagement | Agile Development

Highlighted Experience & Projects

Project Lead, *Multimodal Autonomous Robot Design (MEng Capstone)* **September 2024 - Present**
- Lead a team of 4 engineers in a full-stack robotics development project, integrating mechatronics, control, and perception for a multimodal robot capable of driving and flying.
- Design and implement real-time control algorithms for autonomous trajectory tracking and obstacle avoidance using MPC, achieving robust performance under dynamic vehicle conditions and ensuring stability.
- Develop a physics-based Python simulator to test controllers before deployment, reducing integration time.
- Configure and deploy ROS2 nodes for real-time sensor processing and control execution over CAN Bus.
- Conduct software-in-the-loop and hardware-in-the-loop testing to validate system reliability, identify failure points early, and refine control strategies, mitigating downstream development risks.
- Execute system identification tests on a BLDC motor to characterize its dynamics, improving model accuracy.

Control of Autonomous Flight Project, *University of California, Berkeley* **September 2024 - December 2024**
- Developed a quadcopter flight controller in C++, achieving precise attitude, altitude, and position control.
- Implemented sensor fusion models in C++, utilizing data from optical flow, IMU, and Time-of-Flight sensors to improve sensor data accuracy and provide precise feedback for control.
- Diagnosed and resolved stability issues through targeted subsystem testing, sensor debugging, and controller tuning to validate fixes and improve system response.

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 and CMG base-ring in SolidWorks, improving chassis integration and reducing manufacturing complexity.

Fast Robots Project, *Cornell University* **January 2024 - May 2024**
- Owned end-to-end development of an embedded autonomous RC robot, integrating IMUs, sensors, and motor drivers on an Arduino Nano and implementing real-time control logic 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%.
- Diagnosed hardware issues with an oscilloscope and resolved control and sensing faults by analyzing telemetry and sensor data, improving reliability and reducing latency.

Rapid Prototyping Intern, *Kullman Lab, UCL* **July 2023 - August 2023**
- Designed and iterated on custom 3D-printed mounts for a biomedical automation system, optimizing for volumetric constraints while enhancing modularity, ease of access, and user functionality.
- Conducted rapid iterative prototyping using 3D printing, refining designs based on frequent user feedback to enhance functionality and ease of use.