

# Marcus Prieto

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## Education

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### California Polytechnic State University, San Luis Obispo

Bachelor of Science in Mechanical Engineering with Mechatronics Concentration

December 2024

## Engineering Experience

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### Cal Poly Department of Mechanical Engineering, Behavior, Robotics, and Sensing Group

*Undergraduate Research Assistant*

January 2024 - December 2024

- Applied gait analysis concepts, dynamics, and machine learning to develop predictive models for human movement disorders, integrating biomechanics with real-time data processing. Achieved 100% accuracy in impairment classification tests.
- Engineered embedded software for 2 wearable sensors, implementing algorithms for signal processing, feature extraction, and enhanced gait assessment accuracy in post-stroke rehabilitation, analyzing datasets ranging from 30 minutes to 24 hours.
- Performed machine learning model training and data analysis, designing custom metrics to evaluate performance, optimize classification accuracy, and improve real-time impairment detection, achieving a processing time of approximately 40 seconds per dataset with linear discriminant analysis.

### Cal Poly Robotics Club

*Project lead and co-founder, Micromouse Project*

January 2024 - December 2024

- Designed and implemented a comprehensive software architecture and control system, including dynamic system analysis, sensor integration (IMUs, encoders, IR sensors), and a flood-fill algorithm, enhancing autonomous maze-solving capabilities.
- Led project growth from individual initiative to a team of 5, mentoring members in robotics fundamentals, embedded programming, and hardware integration.
- Successfully utilized developed navigation algorithms and embedded system designs to significantly improve the performance of a subsequent line-following robot, reducing its lap completion time by 67% (from 60s to 20s).

### Member, Battlebots Project

January 2023 - December 2023

- Developed and implemented internal structural components and drive train systems for competitive robotics, using MATLAB and SolidWorks for system simulations, resulting in a fully operational robot with custom-manufactured brackets.

### Senior Capstone project

*Team Member*

January 2024 - December 2024

- Designed and prototyped three modular boundary layer rakes for improved manufacturability and adaptability in aerodynamic testing, reducing costs from a budgeted \$500 per rake to approximately \$20 per rake while maintaining high measurement accuracy under Northrop Grumman (sponsor) specifications.
- Conducted wind tunnel experiments and applied statistical analysis in Python to process velocity profiles and pressure data, validating performance against industry standards.
- Reviewed technical papers and applied engineering principles to develop CAD models, manufacturing plans, and data-driven insights, ensuring feasibility for both 3D-printed prototypes and CNC-milled aluminum versions.

## Academic Projects

- *Gearbox Design Project:* Led a team in designing a custom gearbox, using MATLAB for constraint optimization and SolidWorks for 3D modeling.
- *Embedded Systems Project:* Programmed a microprocessor in Assembly to achieve cooperative multitasking in a mechatronics application.
- *Heat Transfer Simulation:* Created a modular MATLAB script to model transient heat transfer with interactive parameter visualization.
- *Line Following robot:* Collaborated with a partner to design and build a line-following robot for a mechatronics class, developing the firmware architecture, integrating sensors for real-time path detection, and optimizing both hardware and software, improving lap completion time from 60 seconds to 20 seconds.

## Technical Skills

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**Programming:** C++, Python, Assembly, MATLAB, Simulink, Embedded C

**Software and Tools:** SolidWorks, EES, Microsoft Office, Git, ROS (Robot Operating System)

**Engineering and Prototyping Equipment:** Mill, Lathe, CNC, TIG welding, 3D printing, Oscilloscope, Multimeter, Soldering

**Data Analysis and Machine Learning:** Scikit-learn, NumPy, Pandas, TensorFlow, MATLAB toolboxes

**Languages:** Fluent in Spanish, Portuguese, and English