

# Alexander Castromonte

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## EDUCATION

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### Bachelor of Science in Electrical & Computer Engineering

University of New Haven | West Haven, CT

[05/2025]

**Awards:** Capstone Design 3rd Place, MITRE's eCTF 2023 Exemplary Write-up

## SKILLS

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**Programming Languages:** C/C++, Python, VHDL, JavaScript

**Embedded Systems:** Embedded Architecture, Actuator Control, Hardware-Software Integration

**Controls & Automation:** PID Tuning, PLC Programming, Motor Control

**Circuit Design:** Analog & Digital Circuit Design, PCB Design, Power Distribution, Signal Routing

**Tools & Platforms:** Simulink, LTspice, Vivado, MATLAB, Altium Designer, KiCad

**Protocols:** Bluetooth, I2C, SPI, UART, RS232

## WORK EXPERIENCE

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**Electrical Engineer** | *Strength Robotics* | *Norwalk, CT*

[01/2025 – Present]

- Designed complete electrical architecture for AI-powered strength training robotics system, including system-level schematics, component selection, BOM generation, and power budget analysis.
- Engineered motor control subsystems for stepper motors and linear actuators, performing PID tuning to optimize rotation accuracy and minimize mechanical noise during operation.
- Developed custom wiring harnesses and signal conditioning circuits for sensor interfaces, eliminating electrical noise through proper grounding and filtering techniques.
- Implemented I2C communication protocol between Arduino microcontroller and NVIDIA Jetson Orin for real-time sensor data exchange and motor control commands.
- Led hardware-software integration efforts, collaborating with software engineers to interface embedded control systems with mobile application and validate subsystem functionality.

## PROJECTS

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**Protected Automotive Remote Entry Device (PARED)** | *C, Python*

[01/2023 – 04/2023]

- Developed embedded firmware for TI TM4C123GH6PM (ARM Cortex-M4) microcontroller implementing secure car-fob communication over UART with EEPROM data storage.
- Designed hardware-software integration for paired and unpaired key fob devices, configuring GPIO peripherals for button input and LED status indicators.
- Implemented UART communication protocol between two TM4C123G development boards for secure message exchange and authentication handshake.

**NASA & NSF Vented High-Altitude Research Balloon** | *C, C++, Python*

[09/2023 – 04/2024]

- Designed Arduino-based altitude control system with pressure feedback and solenoid actuation, successfully maintaining 25km altitude throughout April 2024 eclipse data collection mission.
- Engineered multi-rail power distribution using LiPo battery and buck converters, supporting multiple voltage rails for sensors, actuators, and communication hardware.
- Optimized LoRa telemetry system to achieve a 67% increase in communication range through antenna selection and power tuning, enabling reliable GPS tracking throughout flight.
- Delivered functional hardware system 84% cheaper than typical \$500 research balloon systems while maintaining equivalent performance, successfully deployed and recovered.

**Autonomous Robot with Obstacle Detection** | *C, C++, Python, ROS*

[09/2024 – 11/2024]

- Designed autonomous navigation system using Raspberry Pi (master) and Arduino (slave) with I2C communication, achieving 90% obstacle avoidance success rate in residential environments.
- Integrated ultrasonic and IR sensors with <50ms obstacle detection response time, enabling real-time navigation at speeds up to 15mph.
- Developed and validated control algorithms through MATLAB and Gazebo ROS simulations, optimizing velocity, acceleration, and error parameters for smooth navigation.