

JUSTIN M. PARRA

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EDUCATION

Rutgers University – New Brunswick, NJ

Bachelor of Science in Electrical and Computer Engineering

Expected December 2027

Major GPA: 3.0/4.0

Relevant Coursework: Programming Methodology I & II (C/C++), Computer Architecture, Digital Logic Design, Microelectronic Circuits, Principles of Electrical Engineering I & II, Linear Systems and Signals

EXPERIENCE

Rutgers Micromouse (IEEE Student Branch)

President & Lead Firmware/Hardware Engineer

New Brunswick, NJ

September 2024 – Present

- Wrote real-time C/C++ firmware on STM32 (ARM Cortex-M) and ESP32-S3 with FreeRTOS tasks: **100 Hz** sensor polling over I²C and ADC, motor PWM, and closed-loop PID control; my team took **1st place** at the 2026 IEEE Montclair Micromouse Competition and 2nd at the 2025 Rowan Regional.
- Designed and routed the robot's custom **4-layer PCB** integrating the microcontroller with analog IR distance sensing, an IMU, dual H-bridge motor drivers, and 5 V/3.3 V rails with reverse-polarity protection.
- Brought up the boards myself: hand-assembled and reworked surface-mount parts, then debugged across the electrical/firmware boundary, probing the **400 kHz** I²C bus, UART, and PWM waveforms with an oscilloscope and logic analyzer.
- Lead a **40+ member** club; set up Git pull-request code reviews and run workshops on embedded C/C++.

Institute of Electrical and Electronics Engineers (IEEE)

Electronics Engineering Lead – VEX Division

New Brunswick, NJ

September 2024 – Present

- Designed a robot network over RS-485, UART, and I²C with differential transceivers, TVS surge protection, flyback diodes, and bus termination to protect logic from motor back-EMF.
- Built a custom PCB sensor hub: ESP32 firmware reads multiple VL53L0X distance sensors over I²C and reports to the VEX Brain over UART.
- Ran hardware-in-the-loop tests under mechanical vibration, verifying packet loss under **0.1%**, and wrote test reports on bus reliability and voltage drop under drive transients.

LPT-KEYPAK

Engineering Intern

Tewksbury, NJ

June 2024 – August 2024

- Commissioned and validated automated high-speed packaging machinery for the Bill & Melinda Gates Foundation, increasing pilot-production throughput by **30%**.
- Diagnosed intermittent electromechanical failures with root-cause analysis and implemented fixes, reducing equipment-related defects by **15%**; troubleshoot PLCs, motor drives, and sensors from **20+** schematics.

PROJECTS

Maze Pathfinding Simulator & Telemetry Analysis

C++, POSIX, Linux, Python, NumPy

- Built a headless C++ simulation harness on Linux that benchmarks Flood Fill against A* across **100+** maze layouts over POSIX pipes, so planner changes are tested off the robot first.
- Wrote a Python serial logger that records robot telemetry at **100 Hz** and computes settling time, damping ratio, and overshoot to compare controller tunings.

Autonomous Vision Line-Following Robot

C++, ESP32-S3, OV2640 Camera, FreeRTOS, PID

- Built a differential-drive robot with onboard C++ image processing to find the line and closed-loop PID heading and velocity control running on FreeRTOS tasks, with exposure and threshold calibration for varying lighting.

Analog Filter & Transient Signal Conditioning

LTspice, MATLAB

- Simulated active second-order filters and op-amp stages and designed low-pass filtering to suppress motor-switching transients on ADC lines.

TECHNICAL SKILLS

Languages: C, C++, Python, Bash, MATLAB, Verilog

Embedded: STM32 (ARM Cortex-M), ESP32-S3, Arduino, FreeRTOS, PlatformIO; I²C, SPI, UART, RS-485, ADC, PWM; board bring-up

Lab Tools: Oscilloscopes, Logic Analyzers, Multimeters, Bench Power Supplies, Soldering and SMD Rework

Design & Tools: KiCad, Altium Designer, LTspice, Linux (Arch), WSL2, Git, GitHub Actions, VS Code

Interests: Soccer (two youth academies in Colombia), varsity tennis, saxophone, painting, building PCs