Anthony Ibarra
Embedded Systems Engineer
(Chicago, IL; Available to Start Onsite)
(773)-387-8485 | 28aibarra@gmail.com | LinkedIn | Portfolio

Education:

University of Illinois Chicago (UIC) **Jan 2023 - May 2025**
Master of Science in Electrical and Computer Engineering Chicago, United States

Relevant Coursework:
- Mechatronics Embedded Design, Adaptive Digital Filters, Linear Systems Theory & Design, Convex Optimization
- Electromechanical Energy Conversion, Audio & Acoustic Signal Processing, Filter Synthesis Design
- Electromagnetic Compatibility, Neural Networks, Advanced Computer Communication Networks

University of Illinois Chicago (UIC) **Aug 2017 - May 2022**
Bachelor of Science in Computer Engineering Chicago, United States

Relevant Coursework:
- Embedded Systems, Control Engineering, Principles of Modern Control, Principles of Automatic Control
- Computer Organization, Computer Architecture
- Robotics Algorithm and Control, Pattern Recognition, Computer Comm Networks, Artificial Intelligence

Technical Skills:

Embedded Programming & Firmware:
- Bare-metal development, RTOS (QXK, FreeRTOS), Embedded C/C++, State Machines
- PID Control, Bootloader Implementation, U-Boot, Device Driver Development

Microcontrollers & SoCs:
- Texas Instruments Tiva C, Freescale MCUs, Raspberry Pi, STM32, Espressif, Arduino Nano
- ARM Cortex-M series, QEMU

Protocols & Communication Interfaces:
- UART, SPI, I2C, BLE, TCP/IP, UDP, Ethernet, RF, LTE

Testing & Debugging:
- Unit Testing, Test-Driven Development (TDD), Pytest, uTest
- Hardware-in-the-Loop (HIL), Tracing, GDB Debugging
- Oscilloscope, Multimeter, RF Analyzer (FieldFox)

Robotics & Control Systems:
- ROS2, Embedded Vision (OpenCV), Sensor Integration
- Autonomous Control, Control Systems

Tools & IDEs:
- Code Composer Studio, Keil µVision, STM32 CubeMX, Arduino IDE
- PlatformIO, VSCode, MATLAB, Simulink, Quartus, Icarus Verilog, Wireshark
- Git, GitHub, Docker, Ubuntu, MySQL

Programming Languages & Hardware Description:
- C, C++, Python, Bash, MIPS Assembly, ARM Assembly, Verilog, VHDL, FPGA Programming

Projects:

Board Bring-up From the ground up – Embedded Systems **March 2026 - March 2026**
(Bare Metal Programming for ARM) | QEMU ARMv7-A & Cortex-A9 MPCore
- Developed bare-metal firmware for ARMv7-A (Cortex-A9 MPCore) using QEMU Versatile Express, simulating board bring-up from reset through application execution.
- Integrated U-Boot bootloader to initialize the system and load firmware images, implementing CMake-based build automation and Bash scripts for compilation, flashing, and debugging workflows.
- Implemented a PL011 UART device driver for the Versatile Express platform, enabling serial communication and runtime debugging.
- Designed and configured interrupt handling using the ARM Generic Interrupt Controller (GIC) on the Cortex-A9 MPCore for interrupt-driven peripheral interaction.
- Built a cooperative task scheduler supporting non-preemptive multitasking for embedded firmware tasks.
- Performed remote debugging with GDB through WSL Bash terminal, connecting to QEMU for step execution, register inspection, and memory analysis.

Bootloader & Firmware Updater – Embedded Systems **Nov 2025 - Nov 2025**
(Blinky to Bootloader: Bare Metal Programming YT)

- Developed a secure bare-metal bootloader and firmware update system for a microcontroller-based platform.
- Implemented AES-based CBC-MAC firmware authentication to verify firmware integrity and prevent unauthorized updates.
- Designed a bootloader state machine with timeout handling to manage firmware update flow, error recovery, and system initialization.
- Implemented flash memory management routines to safely erase and program application firmware during updates.
- Developed a full UART communication driver with interrupt-safe ring buffer implementation to prevent race conditions during packet transmission and reception.
- Designed a custom UART packet protocol including ACK/NACK responses and CRC-based error detection for reliable firmware transfer.

Autonomous-Driving Car – Mechatronics Embedded Design **Jan 2023 - May 2023**
University of Illinois Chicago (UIC) – Chicago, IL

- Led a multidisciplinary engineering team in the design and development of an autonomous embedded system, coordinating hardware, firmware, and testing milestones.
- Designed and implemented a motor driver circuit using MOSFET drivers (single FET, half-bridge, and full H-bridge configurations) controlled via PWM signals from a microcontroller for DC motor actuation.
- Developed a boost converter power supply to support multiple voltage rails for sensors, control electronics, and motor drivers.
- Implemented and tuned PID control algorithms in embedded firmware to regulate steering (servo motor) and vehicle velocity (DC motor) using encoder feedback.
- Designed and fabricated a custom PCB using Altium Designer, generating schematics, BOM, Gerber files, and manufacturing documentation for production.
- Assembled and debugged hardware including SMT and through-hole soldering, PCB masking, and wiring harness creation through crimping and soldering.
- Integrated line-tracking camera sensors and wheel encoders with the microcontroller, implementing sensor filtering and signal processing in embedded software.
- Performed hardware validation and debugging using oscilloscopes, multimeters, and benchtop power supplies to analyze PWM signals, power electronics behavior, and sensor outputs.
- Built a perfboard prototype backup system to ensure continued development and rapid hardware iteration during PCB testing.

Automated Watering Systems, Senior Design Product Development **Aug 2021 - May 2022**
University of Illinois Chicago (UIC) Chicago, United States

- Developed an IoT-based automated plant watering system using an Arduino Nano 33 IoT, integrating soil moisture sensors, plant data, and weather conditions to determine watering decisions.
- Developed C/C++ firmware for Arduino Nano 33 IoT, acquiring soil moisture data and automating irrigation decisions based on thresholds and weather API integration.
- Designed wireless communication architecture enabling device monitoring and control via Bluetooth Low Energy (BLE).
- Built a UDP client–server communication layer between the embedded system and a mobile application for remote monitoring and manual override.
- Developed a cross-platform mobile application using the Kivy framework to display real-time sensor data, weather conditions, and system status.
- Collaborated within a 4-member engineering team, coordinating development tasks and producing weekly technical progress reports.
- Prototyped and tested an integrated embedded hardware–software system combining sensors(moisture sensors), wireless connectivity(bluetooth), and mobile interface.
- Integrated external weather API data with local soil moisture readings to dynamically adjust watering schedules.

Certifications:

- AUTOSAR™ - Embedded Academy
- C Programming for Embedded Applications - LinkedIn Learning
- Introduction to FreeRTOS - LinkedIn Learning
- Learning FPGA Development, Verilog for FPGA,Learning LabVIEW - LinkedIn Learning
- Getting Started with RISC-V - LinkedIn Learning
- Creating and Securing Bluetooth Low Energy (BLE) Application - LinkedIn Learning