Kalan Brunell

kbrune06@gmail.com | kalanbrunell.site

Education

Tufts University, Medford, MA   Expected May 2027
    Bachelor of Science in Computer Engineering   *Dean's List*

Experience

Manufacturing Engineering Intern, Gentex Corporation - Manchester, NH   May 2025 - August 2025
- Designed a custom 2D inspection system to increase manufacturing inspection accuracy by up to 60%.
- Enabled real-time object location and automated quality inspections by integrating the vision system with manufacturing robotics.
- Developed Fanuc robot programs, using with the vision system, to automate manufacturing tasks like soldering, adhesive application, and part manipulation.
- Performed validation and bench debugging using oscilloscopes, logic analyzers, and controlled test fixtures to validate sensor timing, signal integrity, and system reliability.

Projects

FSAE Electric Racecar Accumulator, Tufts Electric Racing - Project Manager   May 2025 - Present
- Leading the design of a removeable high-voltage battery pack for a Formula SAE Electric racecar.
- Designing real-time battery management and monitoring firmware on an embedded STM32 microcontroller.
- Developed PCBs including real-time cell and thermistor monitoring, power distribution and safety systems.
- Assembled and validated packs with Molicel P42A cells, fused links, and safety systems ensuring performance and rule compliance.

Autonomous Color Following Vehicle, Tufts University   September 2025 - December 2025
- Developed an autonomous/Websocket controllable vehicle to navigate via color and object detection powered by an embedded ATMega MCU.
- Created a purpose-built photodiode array and C++ algorithm to use embedded ADCs to detect course markers.
- Implemented WebSocket communication to allow real-time telemetry, remote control, and interaction with other on-field vehicles.

5-Stage Pipelined ARM Processor, Tufts University   September 2025 - December 2025
- Engineered a 5-stage pipelined processor with hazard detection and forwarding in VHDL.
- Designed PC, ALU, byte-addressable memory and register modules, control units, and more from the ground up, before wiring them together for a functional CPU.
- Verified functionality through purpose-built testbenches and simulations in GTKWave.

FIRST Robotics, Lead Engineer, Captain   August 2022 - May 2023
- Developed a retroreflective-based vision system which output real-time distance and angle to target.
- Programmed field-relative swerve drive and autonomous control architecture in WPILib, integrating IMU and encoder feedback for precise odometry and path tracking.
- Integrated sensors, actuators, and motor controllers into robust electromechanical subsystems enabling closed-loop control.

Skills

Programming: C, C++, Python, ARM Assembly, RISC, CMSIS, RTOS, OOP
Embedded & Electronics: VHDL, Waveform Debugging, Digital Logic, FPGAs, I2C, UART, CAN
Circuit & PCB Design: Altium Designer, KiCad, LTspice, Electrical Lab Equipment, Soldering
Robotics & Automation: OpenCV, Limelight, Robotic Control, PLC Programming
Tools: SolidWorks, Onshape, Rapid Prototyping, 3D Printing, MATLAB, Git, LaTeX, ECOs, Microsoft Office