

# Kalan Brunell

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## Education

**Tufts University**, Medford, MA  
Bachelor of Science in Computer Engineering

Expected May 2027  
*Dean's List*

## Experience

**Manufacturing Automation Engineering Intern**, Gentex Corporation - Manchester, NH Summer 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 robotic arms.
- Developed Fanuc robot programs using 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

**5-Stage Pipelined ARM Processor**, Tufts University September 2025 - December 2025

- Engineered a 5-stage pipelined processor with hazard detection and forwarding in VHDL.
- Features IF/ID/EX/MEM/WB stages with support for arithmetic, logic, memory, and branch instructions.
- Implemented hazard detection and forwarding units to resolve data and control hazards, optimizing instruction throughput.
- Verified functionality through purpose-built testbenches and simulations in GTKWave.

**FSAE Electric Racecar Accumulator**, Tufts Electric Racing - Project Manager May 2025 - Present

- Leading the design of a removable 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.

**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 with embedded ADCs to detect and follow course markers via PID control.
- Implemented WebSocket communication to allow real-time telemetry, remote control, and interaction with other on-field vehicles.

**FIRST Robotics**, Lead Engineer, Captain August 2022 - May 2023

- Developed a retroreflective-based vision system which calculated 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:** Lattice Radiant, SolidWorks, Onshape, Rapid Prototyping, 3D Printing, MATLAB, GIT, LaTeX