Kalan Brunell

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Education

Tufts University, Medford, MA — Expected May 2027
Bachelor of Science in Computer Engineering, *Dean's List* — GPA: 3.55/4.0

Experience

Manufacturing Engineering Intern, Gentex Corporation - Manchester, NH — May 2025 - August 2025

- Enabled real-time object localization on production-line robotic arms with custom vision pipelines and frame and coordinate conversion to integrate industrial vision with existing robot controls.
- Developed a vision system for automated manufacturing inspection, improving accuracy and efficiency by reducing the need for manual checks.
- Automated complex assembly tasks like adhesive application and soldering by programming Fanuc robotic arms.

Projects

5-Stage Pipelined ARM Processor, Tufts University — September 2025 - Present

- 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.

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

- Developed embedded STM32 PCBs for battery management and thermistor monitoring with CAN capability.
- Designed cell contact PCBs, integrated fusing, and high-voltage circuitry for a 420V accumulator system.
- Manufactured packs with Molicel P42A cells, fused links, and safety systems ensuring performance and rule compliance.

Autonomous Color Following Vehicle, Tufts University — September 2025 - Present

- 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.

VHDL Arcade Game, Tufts University — November 2024 - December 2024

- Designed a 2048-style game on an UPduino iCE40 FPGA entirely in VHDL.
- Implemented complex logic, custom RAM and ROM modules, with gamepad input and VGA display output.
- Built custom testbenches and test sequences to verify functionality.

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.
- Designed power distribution, motor control, and CAN for Talon FX enabling closed-loop PID control.

Skills

Programming: C, C++, Python, ARM Assembly, RISC, CMSIS, RTOS, OOP
Embedded & Electronics: VHDL, GTKWave, 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, 3D Printing, MATLAB, Git, LaTeX, ECOs, Microsoft Office