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

- Prototyped and implemented a custom 2D vision inspection system by performing full system design, sensor integration, and firmware development.
- Deployed the vision system in conjunction with manufacturing robotics to enable real-time object location and automated quality inspections.
- Developed Fanuc robot programs, in conjunction 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

- 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.
- 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 - 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.

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.

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.

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, Rapid Prototyping, 3D Printing, MATLAB, Git, LaTeX, ECOs, Microsoft Office