

# Kalan Brunell

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## Education

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

## Experience

Manufacturing Engineering Intern, Gentex Corporation - Manchester, NH	May 2025 - August 2025
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- 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.
- Designed prototype fixtures for in-development products optimized for use with the new vision system.

## Projects

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