

Kalan Brunell

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Education

Tufts University, Medford, MA Bachelor of Science in Computer Engineering	Expected May 2027 <i>Dean's List</i>
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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 robotic arms.	
• 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 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.	

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.	

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