

ATHARVA PRASHANT KALE

Boston, MA | kale.ath@northeastern.edu | (857) 245-8916

Linkedin: atharvapkale | Github: AtharvaK1810

SUMMARY

Embedded Systems & Firmware Engineer with proven experience building secure systems using Verilog, C, and low-level communication protocols (UART, SPI, I2C). Designed silicon-based primitives (PUF) on FPGA platforms and developed real-time safety logic for Formula SAE race vehicles. Adept at debugging complex hardware-software interactions using logic analyzers and oscilloscopes.

EDUCATION

Northeastern University, Boston, MA

Dec 2026

Candidate for Master of Science in Internet of Things

Courses: Wireless Sensor Networks & IoT, Computer Engineering Fundamentals, Computer Hardware Security, Machine Learning/Pattern Recognition

MES Pillai College of Engineering, Mumbai, India

May 2023

Bachelor of Engineering in Electronics and Telecommunications Engineering

TECHNICAL SKILLS

- **Programming Languages & Scripting:** C, C++, Embedded C, Verilog, VHDL, Python, Assembly, MATLAB, Bash Scripting
- **Microcontrollers & FPGA:** MSP430, ESP32, ARM Cortex-M, Raspberry Pi, Tang Nano 20K (GOWIN), Xilinx FPGAs, LPC2148
- **Embedded Protocols & RTOS:** FreeRTOS, I2C, SPI, UART, GPIO, MQTT, CoAP, TCP/IP, EtherNet/IP, DLR
- **Hardware & Tools:** Oscilloscope, Logic Analyzer, Altium Designer, SolidWorks PCB, Git, Vivado, GOWIN IDE

RELEVANT EXPERIENCE

Massachusetts Department of Transportation (MassDOT) – Boston, MA

Jan 2026 - Present

Highway Engineering Co-op – District 6 (M/E/C Building Systems)

- **Prevented hardware rejection** by identifying proprietary SFP transceiver validation risks and specifying compliant single-mode fiber standards.
- **Ensured correct signal interpretation in safety-critical environments** by mapping 4-20mA analog outputs from infrared sensors to facility control relays.
- **Resolved physical hardware constraints** by evaluating integration tradeoffs between native PLC software ecosystems and 4-port fiber architectures.
- **Restored combustible gas detection capability** by replacing compromised sensor units and performing field-level validation of automated trigger sequences.

Broad Net India Pvt. Ltd. – Mumbai, India

Jan - Jun 2023

Hardware and Network Engineering Intern

- **Configured** TCP/IP routing tables and DNS settings for edge devices, analyzing packet loss metrics to optimize throughput for commercial clients.
- **Conducted** signal attenuation testing on fiber-optic links using optical power meters, ensuring physical medium integrity met ISP standards.
- **Authored** technical SOPs for signal testing procedures, reducing team onboarding time and standardizing diagnostic protocols.

ACADEMIC PROJECTS

FPGA-Based Ring Oscillator PUF for Secure Key Generation

Jan - Apr 2025

Technologies: Verilog, Tang Nano 20K (GW2A-LV18QN88C8I7), GOWIN IDE, MATLAB, Oscilloscope

- Designed and synthesized a hardware security primitive (PUF) in **Verilog**, utilizing 128 ring oscillator pairs to generate device-unique cryptographic keys from silicon manufacturing variations.
- Optimized logic placement constraints to achieve **85% entropy and 95% reliability**, validating bit stability against voltage/temperature fluctuations using MATLAB analysis.
- Resolved synthesis timing violations and verified clock frequency behavior using hardware-in-the-loop testing on the Tang Nano 20K development board.

Formula SAE - Hyperion Racing Team (SAE)

May 2022 - Feb 2023

Technologies: Proteus, EagleCAD, SolidWorks PCB, SolidWorks Electrical, DAQ, Oscilloscope

- Designed a safety-critical Brake System Plausibility Device (BSPD) complying with **FSAE safety rules**, utilizing discrete logic for fail-safe ignition cutoff.
- Developed the complete low-voltage wiring harness using **automotive-grade** connectors, ensuring reliability under high-vibration conditions.
- **Debugged** in-track electrical issues during endurance testing, coordinating sensor calibration fixes with the powertrain team.

LEADERSHIP ACTIVITIES

Electronics Head of Hyperion Racing Team, Formula SAE Team

Jun 2022 - Apr 2023

- Led electronics subsystem design for combustion vehicle and managed team logistics.