Pranav Kumar

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Summary

Embedded Systems Engineer with 4.5+ years of experience building high-performance embedded software for safety-critical systems in robotics and autonomous applications. Expertise in C/C++, RTOS, kernel development, and real-time firmware optimization. Recognized for collaborative problem-solving, clear technical communication, and contributing to cross-functional teams to deliver scalable, secure, and fault-tolerant embedded solutions.

Technical Skills

Languages: C, C++, Embedded C, Python, Linux, Script, Device Tree, Compilers, GDB, Makefile, JTAG,
Hardware Protocols: ARM, I2C, SPI, CAN, UART, BeagleBone, Raspberry Pi
Developer Tools: Git, Github CI/CD Docker, RTOS(FreeRTOS / Zephyr), FreeRTOS, AUTOSAR, LLVM
Hardware: STM32, TI, Steppers, BLDC, FOC, Xilinx FPGA Spartan
Familiar: Algorithms, LaTeX, Parallel Programming, Rust, OTA updates, BLE, Wireless Protocols

Education

Virginia Tech, MS in Computer Engineering (GPA: 3.9/4.0) *Aug 2024 – May 2026*
Coursework: Compiler Optimization, Multiprocessor Programming, compiler Optimization, Linux Kernel Programming

UIET, Panjab University, B.E. in Electronics and Communication Engineering *May 2016 – Sep 2020*

Work Experience

Graduate Student Researcher, SSRG Lab @Virginia Tech *Dec 2024 – Present*

- Developing an indirect call mechanism for binary decompilation under Prof. Binoy Ravindran, Finding security vulnerabilties in binary code through indirect jump calls.
- Exploring kernel-level instrumentation and low-level code optimization, enhancing system performance and efficiency.

Embedded System Engineer, ARTPARK @IISc Bangalore *May 2023 – Jul 2024*

- Designed low-level drivers and communication stacks for quadruped robotics, boosting system and communication efficiency.
- Developed custom firmware for motor controllers (FOC, BLDC), optimizing real-time performance.
- Implemented high-speed CAN protocols for real-time control in embedded Linux systems, which increased the feedback speed by 50%.

Embedded System Engineer, Flux Auto Pvt. Ltd. *Jun 2021 – Mar 2023*

- Enhanced low-level peripheral drivers for autonomous vehicle kits (tractors, industrial machinery), boosting efficiency by 50%.
- Designed real-time firmware for multi-node CAN networks, ensuring robust distributed control.
- Implemented an RTOS-based firmware and system architecture, reducing downtime by 45% and improving system control.
- Developed automated testing frameworks for embedded systems using Python and integrated CI/CD pipelines to streamline firmware delivery.

Embedded Firmware Engineer, Futuristic Labs Pvt. Ltd. *Jan 2020 – May 2021*

- Developed device drivers and firmware abstraction layers for IoT-integrated autonomous systems, enhancing system performance and reliability.
- Developed kernel-space and user-space communication bridges for real-time data exchange.
- Optimized interrupt-driven firmware to enhance system responsiveness and efficiency, significantly improving processing speed by 30% and reducing latency by 50%.

Projects

Rust Language Memory Reclamation Technique Comparision , Virginia Tech *Aug 2024 – Dec 2024*

- EBR, and HP in Rust for embedded systems; implemented a custom allocator and benchmarked performance on it .

Google Summer of Code (GSOC), BeagleBoard.Org *Jun 2019 – Aug 2019*

- Using BeagleBone and 74hck299 shift Register,a reference design for bi-directional communication for multiple peripherals.

Achievements And Awards

- 2019 - ROSCon-19 Scholarship: Scholarship Holder at Robot Operating System Conference ROSCon-19, Macau, China.
- 2019 - Excellence in Technology Award: Awardee for excellence in Technology field by Mrs. Kirron Kher (MP, Chandigarh).
- 2019 - Team leader of 4 help to got 1st Award at Design and Idea Competition by IIC, Panjab University at Chandigarh.
- 2019 - Mentor of winning team of 8 people at Smart India Hackathon-2019 by Kokuyo Camlin at IIT Hyd.
- 2021-2022 - Best Employee Awards: Three times winner of Best Employee per Quarter at Flux Auto.