

Sakthivel Ponnampalayam Sivakumar

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Summary

Firmware engineering professional with hands-on experience in C, C++, and Python, and competencies in embedded systems, real-time control, and networking protocols. Demonstrated ability to design and implement software solutions and device drivers across diverse hardware platforms. Available for Co-op/Internship from January to August 2026

Education

Northeastern University – Boston, USA

Dec 2026

Master of Science, Electrical and Computer Engineering

GPA: 3.5

Coursework: Computer Architecture, Operating Systems, Hardware and System Security, Computer Networks

Anna University - Chennai, India

May 2024

Bachelor of Engineering, Electronics and Communication Engineering

GPA: 3.6

Coursework: Digital Design, Embedded Systems, Digital Signal Processing, Internet of Things

Work Experience

Movement Neuroscience Lab

Jun 2025 - Present

Firmware Intern

Boston, MA

- Developed hard real-time plugins in C++ within the Real Time Experimental Interface, enhancing understanding of data flow and latency-sensitive control structures essential for firmware validation and embedded system development.
- Engineered the streaming of real-time data over TCP from a server to PC, ensuring low latency and reliable delivery, aligning with rigorous unit testing and integration test practices in communication system protocols.

Northeastern University

Jun 2025 - Aug 2025

Teaching Assistant

Boston, MA

- Mentored over 10 students in assembling RISC-V like single cycle processors on TUL PYNQ Z2 boards using Xilinx Vivado, reinforcing hands-on experience with low-level hardware-software integration required for device driver development.
- Conducted weekly recitation sessions on digital logic fundamentals, including ALUs, register files, memory units, and instruction decoders, effectively bridging theoretical concepts with practical implementation in embedded systems.

Emertxe

Jan 2023 - June 2023

Embedded and IoT Engineer Intern

Bangalore, India

- Designed a Bash-based system monitoring tool in a Linux environment to automate the collection of CPU, memory, and disk usage metrics every 2 hours, improving visibility into resource utilization and system health
- Developed a low-cost (\$15) Real-Time Health monitoring system using ESP32, MAX30102, & OLED to measure SpO2, BPM, body temperature, and saving it on ThingSpeak to maintain a cloud-based patient record and easy future access

Projects

Various Architecture Benchmarking (C, ARM_v8, x86_64, Linux)

Sep 2025 - Oct 2025

- Benchmarked Dhrystone across ARMv8 and x86_64, profiled with GPROF and validated hotspots with assembly snippets
- Optimized LINPACK on x86-64 using GCC by experimenting with compiler switches, BLAS/math libraries, and FP extensions
- Produced a comparative ISA analysis by compiling a Dhrystone basic block for ARMv8 vs x86 and explaining each instruction

Development of OS Primitives (C, Linux, SSH)

Feb 2025 - Mar 2025

- Developed a Bare-Metal OS implementation in C, creating custom system call wrappers (read, write, exit), ELF executable loader, and memory management functions using mmap and achieving successful execution of dynamically loaded programs through custom syscall tables
- Engineered multi-threaded context switching mechanism with stack management, implementing yield functions and custom stack allocation (4096-byte stacks) to enable seamless thread switching between two processes

Reliable Data Transfer Protocol (C++, WSL, SSH, Vim)

Oct 2024 - Dec 2024

- Implemented Alternating Bit, Go-Back-N protocol in C++, achieving 95%+ packet delivery rates under various loss and corruption scenarios while maintaining protocol correctness through comprehensive checksum validation and timeout management
- Conducted comprehensive performance analysis comparing two transport protocols across 1000+ message transmissions, under 6+ different network conditions and window sizes as test cases

Technical Skills

Languages	:	C, C++, Embedded C, Python, Assembly (RISC-V), Verilog, Shell/Bash Scripting
Tools	:	Git, CMake, Docker, Wireshark, Xilinx Vivado, KiCAD, LTSpice
Microcontrollers	:	STM32, Arduino, ESP32, RPi, Device Drivers
Protocols	:	UART, SPI, I2C, CAN, HTTP, TCP/IP, SSH
OS	:	Linux, Windows, FreeRTOS