

Bhakti Rajeshkumar Ramani

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EDUCATION

University of Colorado Boulder, Boulder, USA

August 2024 - May 2026

Master of Science, Embedded Systems Engineering & IoT

GPA: 3.70/4.00

Honors: Merit-based Scholarship

Courses : Embedded System Design, Principles of Embedded Software, Advanced Embedded Linux, Low Power Embedded Design, Concurrent Programming, IoT Embedded Firmware

L.D. College of Engineering, Ahmedabad, India

October 2020 - May 2024

Bachelor of Engineering, Electronics and Communication

GPA: 8.59/10.0

WORK EXPERIENCE

University of Colorado Boulder

December 2025 - Present

Teaching Assistant, IoT Firmware

Boulder, USA

- Developed some curriculum slides covering BLE, WiFi, & Thread and troubleshooting support
- Conducted code reviews focusing on power optimization and memory management for embedded systems

University of Colorado Boulder

January 2025 - December 2025

Teaching Assistant, Signal & Systems

Boulder, USA

- Assisted students providing support with coursework related to MATLAB, Simulink, and Signal Systems concepts.

Amazon Web Services, Annapurna Labs

May 2025 - August 2025

Firmware Engineering Intern

Austin, USA

- Created a firmware validation framework for PCIe Gen5/Gen6 systems, cutting manual test time by 60% through automation in Shell and Python
- Integrated cross-platform automation workflows into the framework, improving scalability across various server architectures
- Built PRBS-Retimer error analysis tool generating CSVs and visual analytics per link/chip/MAC, reducing manual analysis
- Performed OSFP cable qualification using firmware diagnostics and signal integrity analysis to ensure compliance and reliability

Scanpoint Geomatics Ltd

December 2022 - July 2023

Firmware Developer, Intern

Ahmedabad, India

- Developed TFT display drivers for RISC-V-based UHF metal detectors, implementing SPI-based graphics rendering with <50ms touch response time
- Architected color management system for TFT displays, incorporating industry-standard color calibration techniques.

SKILLS

- Programming Languages:** C, C++, Python, Bash, ARM Assembly
- Microcontrollers:** STM32 (Cortex-M0/M4), ESP32, nRF52, ATmega, 6502, 8051
- Operating Systems:** FreeRTOS, Zephyr RTOS, Embedded Linux, Unix,
- Protocols:** UART, SPI, I2C, BLE, WiFi, USB-PD, HID, PCIe
- Tools:** GDB, J-Link, STM32CubeIDE, Keil, Git, Make/CMake, KiCad, Altium
- Hardware:** Oscilloscope, Logic Analyzer, Spectrum Analyzer
- Concepts:** Device Drivers, DMA, Interrupts, Power Optimization, Bootloaders, CI/CD POSIX, Unit testing, Linker Scripts

PROJECTS

BLE Capacitive Trackpad from Ground Up

- Designed a low-power end-to-end system with a custom PCB featuring Tx-Rx pads, EFR32BG13 (cortex-M4) for mutual capacitance sensing
- Wrote firmware drivers for capacitive touch, gestures, haptics and integrated BLE HID-over-GATT for wireless communication.
- Implemented features such as capacitive touch sensing, multi-tap & hold, scroll, macro switches, haptic feedback and USB-C charging.

8-bit CPU | [Link](#)

- Built a fully functional 8-bit CPU from the ground up on perf board using soldering, utilizing **TTL logic gates** and an **EEPROM**.
- Designed 16-byte RAM, x86-inspired ALU, and microprogrammed control unit for instruction decoding/execution, enabling computations.
- Integrated a PC, an Instruction Decoder, 8-bit GPR, gaining 1kHz clock speed with manual clocking capability for step-by-step debugging.

File System & NAND Flash Drivers with ARM Dev Board

- Developed drivers for raw NAND Flash memory, with Bad Block Management and Wear Leveling algorithms for memory reliability.
- Optimized storage efficiency by combining **FLogFS with custom drivers**, ensuring efficient block allocation and garbage collection algorithms.
- Achieved improved data integrity and device longevity through efficient Flash management and file system optimization.

Drivers for STM32

- Programmed bare-metal peripheral drivers (**DMA, DAC, ADC, I2C, PWM, SPI, UART, watchdog, Timer**) for STM32 Cortex-M0 & M4
- Implemented state machine, interrupt-driven DMA handling for efficient data processing, and optimized codebase through assembly

Bare Metal RTOS in STM32F411 using C & ASM

- Wrote a bare-metal RTOS for STM32F4 (Cortex-M4) with ARM Thumb mode Context Switching and SysTick-based Task Scheduling.
- Modeled (**Round-Robin, FCFS, Periodic**) schedulers and synchronization primitives such as **semaphores and mutexes**.

Retro Computer Recreation (6502-based Computer) | [Link](#)

- Constructed 6502-based embedded system with external RAM/ROM, using reset vector and memory access control with logic gates.
- Utilized 256K Parallel EEPROM via chip programmer, implementing core 6502 instructions (LDA, STA, BEQ, JSR, CMP, PHA, PLA).