Arpit Sakhreliya

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Education

University of Maryland (UMCP), College Park, MD — **Aug '24 - Present**

MEng- Electrical and Computer Engineering

Relevant Coursework: Computer architecture | Compilers and Optimization | Embedded system hardware | CMOS VLSI Design | System theory.

Vishwakarma Government Engineering College (VGEC), Ahmedabad, India — **Oct '18 - Jul '22**

BE- Electrical Engineering — GPA: 8.5/10

Work Experience

Teaching Assistant | Computer Organization for Embedded Systems — **Jan '25 - Present**

- Facilitated weekly discussions for 15 students, addressed technical queries, graded assignments, and mentored 4 semester-long projects on computer architecture, MIPS/RISC assembly, ISA design, and microarchitecture.

Embedded Software Engineer | Prayosha Food Services Pvt. Ltd, India — **Apr' 24 - Jun' 24**

- Delivered production-level firmware on ESP32, integrating Quectel EC16Q GSM module via UART for stable 4G internet connectivity.
- Developed a binary handling library for UART-based firmware updates, implemented custom partitioning with ESP-IDF, and added rollback functionality for secure OTA updates, improving system stability using FreeRTOS and minimizing update failures.

Junior Research Fellow | SysIDEA Robotics Lab | IIT Gandhinagar, India — **May '22 - Apr '24**

- Engineered a STM32H743ZI based control unit and drivetrain for the shoulder joint of the humanoid robot, featuring sensor-less torque estimation and MATLAB interface integration with CAN2.0b.
- Implemented firmware with Kalman-based estimation and RLS for precise motor parameter identification, dynamic modeling, and joint control, leveraging NI-RIO FPGA as a differential equation solver accelerator.

Academic Projects

FPGA-Based Custom ALU Implementation for Real-Time Signal Processing — Aug '24 - Oct '24

- Built a custom ALU on Nexys 4 DDR FPGA using FSMD architecture in Verilog with Vivado, optimizing 16-bit floating-point arithmetic, Kalman filtering, and matrix multiplication, significantly reducing computational overhead.
- Formulated a custom instruction set to accelerate computations and integrated UART for data exchange with ATmega328, significantly enhancing and enabling efficient, real-time signal processing and computational tasks.

Cache Simulation and Performance Analysis — Oct '24 - Dec '24

- Programmed a trace-driven cache simulator in C, supporting configurable cache size (64B–16MB), block size (16B–16KB), and associativity (1–16 way) with write-back/write-allocate policies.
- Integrated MESI snoopy protocol for multi-core cache coherence and implemented LRU replacement for set-associative caches, monitoring miss rates, replacements, and demand fetches.
- Analyzed SPEC CPU2017 traces to optimize cache configurations, reducing miss rates and access latency; leveraged CACTI to minimize evaluating dynamic energy consumption, leakage power, and AMAT for enhanced energy efficiency.

Out-of-Order RISC-V Pipeline Simulator (Tomasulo Algorithm Implementation) — Aug '24 - Oct '24

- Developed a cycle-accurate, out-of-order RISC-V processor simulator (RV32I-F ISA) implementing Tomasulo's Algorithm for register renaming, dynamic scheduling, and in-order commit.
- Designed a seven-stage pipeline with multi-cycle functional units and writeback, resolving structural, data, and control hazards.
- Engineered instruction queue, reorder buffer (ROB), and memory conflict queue for load/store dependency handling and validated performance using benchmark assembly programs.

Honors And Awards

- **May '23:** Acknowledged in *"Event-Driven Intermittent Control in Human Balancing"* for IMU data acquisition system (Link)
- **Jul '22:** Nidhi Prayas grant for the development of an Analog-Adaptive embedded drive for actuators | **($8500)**
- **Jan '21:** DIC Grant for Adaptive Surface Irrigation System, funded by MHRD. |**($900)**
- **Aug '21:** Robotics team member, ranked 9th in ABU Robocon International competition, Jimo -China.
- **Oct '20:** SSIP Grant for the Intelligent IoT Pumping System project was funded by the Gujarat Govt. | **($1150)**

Skills

Programming Languages: C, C++, Verilog, Python, Assembly

Software/Tools: Vivado, Cadence, Linux, Altium, Keil, STM32CubeIDE, MATLAB, Multisim, LabVIEW, ThingWorx, Kepware.

Libraries & protocols: OpenCV, PyTorch, Pandas, NumPy, RS-485, Ethercat, MQTT, C-make, SPI, I2C, UART, CAN, TCP, UDP.