Zain Merchant

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Education

Columbia University *New York, NY*
MS Computer Engineering *Expected Dec 2023*
Relevant Coursework: Adv. Logic Design, SoC Platforms, Reinforcement Learning, Intelligent & Connected Systems

The University of Texas at Dallas *Richardson, TX*
BS Computer Science *Dec 2019*
Relevant Coursework: Digital Logic, Operating Systems, Adv. Data Structures & Algorithms, Machine Learning

Experience

NASA Langley Research Center *Hampton, VA*
Computer Engineer — Flight Software Systems Branch *Jan 2020 — Jul 2022*
- Lead the development of a high-fidelity simulator for the Navigation Doppler Lidar instrument.
- Created the simulator for software-in-the-loop testing during the creation and verification of ground / flight software; awarded agency's Superior Accomplishment Award based on feedback from end users.
- Designed, implemented, and verified firmware for satellite communication, instrument data collection, and spacecraft operation (in C for FreeRTOS / Linux utilizing TCP, SPI, I2C, DMA, and Ethernet on ARM SoCs).
- Built Python and C++ tools for ground system, data visualization, and automated hardware testing.
- Architected pipeline to automate science data collection and processing via AWS S3, Lambda, and EC2.

NASA Langley Research Center *Hampton, VA*
Pathways Co-Op (Fall & Summer) — Flight Software Systems Branch *Sep 2018 — Jul 2019*
- Built a memory access driver in C / FreeRTOS, allowing for thread-safe allocation, wear leveling, etc.
- Developed GUIs for debugging and interfacing instrument subsystems using PyQt and ImGui.
- Wrote an equatorial mount control subsystem in C / FreeRTOS. Integrated within SAGE IV flight software.
- Created Ruby scripts to automate test procedures and verify multiple instrument subsystems.

The University of California, San Diego *La Jolla, CA*
Undergraduate Researcher — Engineers for Exploration REU *Jun 2018 — Aug 2018*
- Composed C++ High Level Synthesis (HLS) FPGA overlays for acquiring I2C sensor data, PID control loop, and PWM motor control for a Xilinx PYNQ (Zynq) development board. Used as RC drone flight controller.
- Developed similar functionality in software for a MicroBlaze soft-processor to compare resource utilization, performance, and complexity against HLS design. Collaborated with team to publish research findings.

NASA Johnson Space Center *Houston, TX*
Intern — Integrated Guidance, Navigation, and Control Analysis Branch *Aug 2017 — Dec 2017*
- Analyzed ascent abort procedures and assisted in designing models to characterize propellant slosh for the SpaceX Crew Dragon landing / orbit tanks. Generated data using NASA's Trick Simulation Environment.
- Created a tool in Python to render propellant slosh for various tank geometries in 3D using simulation data.

Massachusetts Institute of Technology *Cambridge, MA*
Undergraduate Researcher — Haystack Observatory REU *Jun 2017 — Aug 2017*
- Evaluated SoCs, microcontrollers, and software frameworks for an initial avionics system design.
- Wrote software in C and C++ for a remote command / telemetry interface over Iridium, monitoring system resources, sensor data collection, and power reduction optimizations. Developed on FreeRTOS and Linux.

Technical Skills

Languages: C, C++, Python, Matlab, SystemC, Verilog, SQL, Swift
Frameworks & Tools: FreeRTOS, Flask, Docker, Amazon Web Services (AWS), SwiftUI, Git, GNU Make