Zain Merchant

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Education

Columbia University   *New York, NY*
Master of Science, Computer Engineering   *Expected August 2023*

The University of Texas at Dallas   *Richardson, TX*
Bachelor of Science, Computer Science   *December 2019*

Languages & Tools: C, C++, Python, Swift, SQL, FreeRTOS, GNU Make, Git, Docker, Xilinx Vivado, Flask

Experience

NASA Langley Research Center   *Hampton, VA*

Computer Engineer — Flight Software Systems Branch   *January 2020 — Present*
- Lead development of a high-fidelity simulator for the Navigation Doppler Lidar instrument. The simulator was used in software-in-the-loop testing during the creation and verification of ground / flight software.
- Awarded agency's Superior Accomplishment Award based on feedback from industry partners.
- Developed flight software modules / drivers in C to interface with various peripherals (MMIO, Iridium, actuators, sensors, etc.) over protocols such as SPI, I2C, UART, Ethernet, TCP/IP, and SpaceWire.
- Created tools in Python and C++ for ground system control, test automation, and data visualization.

Pathways Intern — Flight Software Systems Branch   *May 2019 — July 2019*
- Created a memory access driver in C / FreeRTOS, allowing for thread-safe allocation, wear leveling, etc.
- Developed command and telemetry GUIs for debugging and interfacing instrument subsystems using PyQt.

Pathways Intern — Flight Software Systems Branch   *September 2018 — December 2018*
- 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   *June 2018 — August 2018*
- Used C++ High Level Synthesis (HLS) to write FPGA overlays for acquiring I2C sensor data, PID control loop, and PWM signal generation for a Xilinx PYNQ (Zynq) development board. Used for creation of an RC drone flight controller. Used Jupyter Notebooks for debugging and functional demos.
- Developed similar functionality in software for a MicroBlaze soft-processor to compare resource utilization, performance, and complexity against HLS design. Published research paper reporting findings of approach.

NASA Johnson Space Center   *Houston, TX*

Intern — Integrated Guidance, Navigation, and Control Analysis Branch   *August 2017 — December 2017*
- Analyzed ascent abort procedures and assisted in creating 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   *June 2017 — August 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.

Publications

B. Cain, **Z. Merchant**, I. Avendano, D. Richmond and R. Kastner, "PynqCopter - An Open-source FPGA Overlay for UAVs," in *2018 IEEE International Conference on Big Data (Big Data)*, Dec. 2018, pp. 2491-2498. [Online]. Available: https://ieeexplore.ieee.org/document/8622102.