Zain Merchant

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Education

B.S. in Computer Science, The University of Texas at Dallas *August 2014 — Present*

Programming Experience: Python, C / C++, Java, MATLAB, Arduino, OpenCV, SQLite, FreeRTOS, and Xilinx Vivado

Relevant Coursework: Algorithm Analysis & Data Structures, Computer Architecture, Digital Logic & Computer Design, Operating Systems Concepts, and Artificial Intelligence

Extracurriculars: American Institute of Aeronautics and Astronautics (Design Projects Director), SpaceX Hyperloop Pod Competition 2016 (Flight Control Team), Robotics and Automation Society (Tutor)

Experience

NASA Langley Research Center; *Hampton, VA* *September 2018 — Present*
Pathways Co-Op — Flight Software Systems Engineering Branch (SAGE IV)
- This fall I will be working on the SAGE IV CubeSat to obtain high accuracy stratospheric aerosol data via solar occultation.
- The project will focus on creating FreeRTOS tasks for the system and writing Ruby scripts for telemetry and command verification.

The University of California, San Diego; *La Jolla, CA* *June 2018 — September 2018*
Research Affiliate — Engineers for Exploration
- Developed an FPGA based flight controller for a remote control hexacopter. Wrote FPGA fabric overlays for sensor communication, a closed loop PID controller, and PWM signal generation.
- Wrote fabric code in C / C++ utilizing the High Level Synthesis (HLS) tools in the Xilinx Vivado Design Suite. Created Jupyter Notebooks Python scripts to interface with the fabric for debugging and tuning.

NASA Johnson Space Center; *Houston, TX* *August 2017 — December 2017*
Internship — Integrated Guidance, Navigation, and Control Analysis Branch (EG4)
- Used the Trick Simulation Environment to analyze ascent abort procedures and assisted in creating models to characterize propellant slosh in the SpaceX Crew Dragon landing and orbit tanks.
- Created a Python modeling and 3D animation tool to visualize propellent slosh movement within various tank geometries.

Massachusetts Institute of Technology; *Cambridge, MA* *June 2017 — August 2017*
Research Affiliate — Haystack Observatory
- Designed a prototype avionics system for an air-dropped monitoring device to be used for autonomous antarctic research.
- Wrote software in C / C++ for autonomous system health monitoring, process management, data collection, and power reduction optimizations. Developed on FreeRTOS and Linux.

NASA Johnson Space Center; *Houston, TX* *January 2017 — May 2017*
Internship — International Space Station On-Orbit Engineering Office (OB2)
- Developed an Android and iOS mobile application in C# (using Xamarin) to interface with the ISS Mission Evaluation Room Web System and various NASA / ISS resources.
- Created a user login and verification system, SQLite database, and search function for the console log.

Projects

Blade Runner Voight-Kampff (Visual Polygraph) Machine in Python
- Using OpenCV and Python, I developed a program to estimate heart rate visually (via webcam) from changes in skin pigmentation.
- The project also utilized an Arduino to measure body temperature and perspiration to calculate a user's stress.

iOS Road Conditions Detection and Reporting Application in Swift
- Created an application to autonomously detect and report potholes using an iPhone's internal GPS, gyroscope, and accelerometer.
- The city of Richardson received a $25,000 grant from State Farm for continued development on the project.

Awards

- Texas Space Grant Consortium Scholarship 2018
- 1st Place at HackNAU 2017
- 1st Place at Richardson Community Hack Week 2016
- Best Microsoft Hack + Best Drone Hack at TAMUHack 2015