Marcus Francisco

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Education:

- **University at Buffalo:** GPA: 3.946 / 4.0
  BS, Electrical Engineering, May 2024

Relevant Coursework:

Signals and Systems, Digital Principles, C++, Circuit Analysis. Electronic Devices & Circuits, VHDL Digital Design Logic.

Honors, Awards and Publications:

- **University at Buffalo Dean's List:** 2020 – 2022
- **Recipient of Russell L. Agrusa Award:** 2022 Student Innovation Competition for Research Project.
- **Tau Beta Pi:** UB NY Nu Chapter. 2022 - Present
- **Recipient of the *Pride of New York* Scholarship.** Selection for outstanding academic achievement.
- **Research Project Publication 2022.** Prototype of Interactive Digital Twin in Cyber Manufacturing
- **National Honor Society:** 2018 – 2020
- **Tech Wars** 2018-2019
  1st place in for 3D modeling and CAD design.
- **Conference All-State Composer and Musician:** State-wide selection of brass quintet composition. Performer in All State Symphonic Band.
- **Scholar Athlete:** 2018 – 2019

Skills:

- **Hardware, Electronics and Circuit Design:** Programming microcontrollers and use of hardware description language. Skilled with designing for Integrated Circuits, ESP-32, IoT and Embedded Systems, Arduino, I2C & Rx/Tx intercommunication, C++, and VHDL. Frequent use of soldering iron and breadboard.
- **CAD design and 3D modeling:** Extensive use of Autodesk Inventor and CNC technologies.
- **Woodworking, Power Tool Usage, and Manufacturing:** Skilled in woodworking and hardware assembly.
- **Presentation of Research Projects:** Presenting to judges and audiences in academic conferences and competitions.
- **Computer Programming Proficiency.**
- **Mentor for ACM:** Mentor projects and coached prioritization.
- **French Horn, Piano, Voice, and music Composition.**
- **Proficient in Microsoft Office Programs.**

Work Experience:

Researcher for The University at Buffalo REU Program, 5/30/2022 – Present: Worked on the Interactive Digital Twin Campus Prototype. I became the project lead at the start of Spring 2023. Collaborated with a team of researchers in the summer of 2022 to create a 3D-printer that procures a digital twin, relays data, and allows printer control through a website interface. I program firmware for the ESP-32 microcontroller, which is the system master. The ESP-32 must maintain web-socket connection to a server, transmit data between devices, control camera-carrying servo motors, drive an LCD display, process user commands, process data from a server, and relay acquired data to a server. The ESP32 is a budget chip, therefore extensive and rigorous optimization was essential. This demands the very best of my programming and hardware knowledge. My knowledge of Rx/Tx, I2C, and WebSocket communication protocols were utilized. The Campus Prototype of Interactive Digital Twin was published in 2022 for the Association of Computing Machinery. I traveled to Boston for the 2022 ACM Sensors and Systems Conference to present this project. Our team, consisting of all undergraduate students, won the 2022 Russell L. Agrusa UB CSE Student Innovation Award.
Supervisor: Dr. Chi Zhou

Tapecon Electrical Engineering Internship, 1/4/2023 – Present: Working 20 hours per week during the Spring 2023 semester and continuing through the summer. Job responsibilities include designing demonstrator circuits for FHE technology. FHE stands for "Flexible Printed Electronics". Design involves programming microcontrollers, using knowledge of circuit analysis, selecting appropriate components for the budget and purpose, designing circuits for those components, and adapting those designs to the FHE form factor. FHE devices are electronic circuits that are printed on a flexible dielectric sheet. The flexible nature prompts its application in wearable technology, health monitoring systems, and provide an affordable and sustainable alternative to conventionally printed electronics. My responsibilities also include documenting all designs and developing a design process for which future engineers will refer to and learn from.
Supervisor: Tapecon Electrical Engineer Rafael Tudela

Professional French Horn Player and Musician: Performance in various gigs throughout Western New York. I am a member of the American Legion Band Post 264, Amherst Symphony Orchestra, and the Niagara Frontier Brass Quintet. For soloistic work, I also perform at Saint Gregory the Great Church, and at other churches throughout Western New York.

Technician Assistant for the University at Buffalo Department of Geology, 6/10/2021 - 8/20/2021: Duties at UB Geology included the sample inventory, sensitive equipment handling, and internal department functions. I relocated outdated machines and hardware. With an estimated 50 computers and hundreds of cables, I filed away the old technology into a new room with an intuitive strategy for the organization. Ensuring the devices were accessible but not cumbersome was important when legacy

programs are required for graduate work and research. The movement of samples for research, updating syllabi, porting the department phone lines, and Excel work were part of my responsibilities. Working with large arrays of information required efficient use of Excel and attention to detail.
Supervisor: Susan Marshall

BJ's Wholesale Club, 6/1/2020 – 8/29/2021: Summer job during the pandemic to pay for college. Worked full time hours. I worked in nearly every department because essential workers were desperately needed during the 2020 lockdown. I was Integral to the opening and closure of the store. My work involved cash handling, organization of shipments, food preparation, and maintenance. I was always willing to do what was necessary to keep the warehouse functioning and safe even if it was beyond my job description. This is a mindset that I carry into my more advanced bodies of work.

Projects:

UB Hackathon 2020 - 2022: $2,000 Grand Prize won in 2020. Project team "Code Red" is a team of two Electrical Engineering majors and two Computer Science majors. Our projects over the years feature progressively more advanced home protection and security systems. The team created the "Red Alert" project that prevents house fires using circuits, servos, and a server backend. The team planned, designed, and presented this project within 24 hours. Red Alert was entered into the UB Hackathon in 2020 and won the grand prize and other awards such as the "Best Hardware" award.

Project Red Alert utilized an Arduino, servos, a database, and a modified smoke alarm to both alert the user of fire via SMS and extinguish fires using servo-actuated sprinklers. The idea behind this project began with the fact that most garages in the US do not have smoke detectors. We intend to solve this flaw in the long run with a more advanced system to protect a hazard-prone area of the house.

Modular Security System developed in 2022. The Code Red team created a modular security system for the Hackathon competition. Project "Big Transistor Security" won the "Best Hardware Hack" award. We used various programming languages, Arduino, and electronics to produce a modular system that could be developed and advanced by homeowners themselves. The components we used were intended to express the wide range of devices that are compatible with our design, such as an ultrasonic sensor and a servo-actuated air horn deterrent. I assembled hardware, wired the circuits, and created a demo video for the judges. The main hallmark of our design was its ability to be augmented to fit any space or scenario using a wide variety of components.

Printer Filament Recycling Project "Code Green": Developed in Fall 2022. Code Green recycles plastic bottles and turns them into useable 3D printer filament. Project was awarded the UB-Hacking *"Best Hardware Hack"* and the *"Hack with a Purpose"* award from the UB Blackstone Launchpad. The system featured a machine built within 24 hours to process plastic bottles into ribbon, and extrude the ribbon into 3D printer filament using a modified hot-end with a strong motor. The project also includes a web interface which allows users to view the filament creation and printing process from a remote location.

Pinnacle Hackathon 2021: Pinnacle 2021 was an invite-only hackathon that internationally selected 166 participants to compete for $13,860 in prizes. After winning the UB Hackathon grand prize in 2020, team Code Red was awarded tickets to Pinnacle 2021, heralded as the "Olympics of Hackathons". The team was flown to Dallas Texas to compete. Our project was named "Prism", and used augmented reality to aid manufacturing processes. Code Red won awards for 3D printing & CAD design. Project "Prism" used a Magic Leap headset to create holograms in a user's vision, and demonstrated the assembly of a 3-D printed model that the judges could interact with.