Jonathan Swindell

601 John Wright Drive CVG 411-A | Huntsville, AL 35899 | 256-606-3300 | jes0057@uah.edu

EDUCATION

University of Alabama in Huntsville Huntsville, AL

Bachelor of *Engineering* in *Computer Engineering* Expected Graduation: May 2023

- GPA: 3.954/4.000
- UAH Honors College
- Mathematics Minor

RECENT EXPERIENCE

University of Alabama in Huntsville Huntsville, AL

Mathematics and Engineering Tutor August 2021 – Present

- Tutored math and upper-level engineering classes.
- Conducted efficient, student-led sessions that provided detailed content review in a traditionally difficult course.
- Facilitated sessions for students while accommodating for the needs of the student.
- Kept track of session documentation and communicated that information to program coordinators.

Resident Assistant and Desk Assistant August 2021 – Present

- Created and advertised programs and events for students.
- Performed inspection rounds of the building and communicated with faculty, students, and law enforcement.
- Wrote formal reports of all incidents.

Mercury Systems Huntsville, AL

Software Engineering Co-op December 2019 – August 2021

- Read schematics and technical documentation and implemented software interfaces for hardware and firmware components.
- Programmed customer software demos to promote our products and give examples of Mercury's API and C and C++ programming languages.
- Designed and implemented a diagnostic extension to support multi-threaded environment monitoring.
- Upgraded diagnostic software.
- Migrated source control from local storage to remote Bitbucket repositories and implemented submodules.
- Used Jira task management systems to support the engineering team with software errors.
- Worked with the Mixed Signal group's expert engineers in the support, design, and implementation of high-fidelity products for our customers.

Cook Museum of Natural Science Decatur, AL

Assistant Educator May 2019 – July 2019

- Researched topics for the creation of programs and curriculums.
- Inspired children to learn about the amazing world around us by engaging them to ask questions and find answers.

Chick-fil-A Decatur, AL

Team Member June 2018 – August 2018

- Worked with the team and managers to provide timely, high-quality food to our guests.

PUBLICATIONS

Gibson, C. V., Swindell, J. E., & Collier, G. D. (2021). Assessment of Prehospital Monitor/defibrillators for Clostridioides difficile contamination. Prehospital and Disaster Medicine, 1–2. https://doi.org/10.1017/s1049023x21000376

SKILLS

- Basic proficiency: Computer Networking**,** Python programming, Java programming
- Intermediate proficiency: Circuit Analysis, MATLAB programming, Linux operating system, SQL, Qt, Microsoft Office Suite, Communication protocols: SPI and UART, MSP430 ADC and DAC
- Advanced proficiency: C and C++ programming, Git

CERTIFICATIONS

ITTT 120 hour Teaching English to Speakers of Other Languages Certificate through International TEFL and TESOL Training

College Reading and Learning Association (CRLA) Level 1

HONORS AND AWARDS
National Society of Leadership and Success | *Nominated Member* | September 2020
Valedictorian Everest Academy High School | *Recipient* | May 2019
North Alabama Regional Science and Engineering Fair | *Honorable Mention* | March 2019
UAH Merit Scholarship | *Recipient* | December 2018

AFFILIATIONS

Alabama Biosciences Research Institute, Inc Athens, AL

Co-Director/Research Scientist July 2021 – Present

Cofounded a 501(c)(3) non-profit research institution with an IRB approved by the Office for Human Research Protections (OHRP). Alabama Biosciences Research Institute, Inc. (ABRI) exists to perform high-quality research. The researchers of ABRI represent many distinct disciplines in the natural sciences and STEM fields and implement an interdisciplinary approach to research.

Approvals:
- Institutional Review Board (IRB) Number | IRB00013259
- Alabama Secretary of State Entity (AL SOS) Number | 836 – 565
- Internal Revenue Service Employee ID (IRS 501c3) Number | 86-2241521

Roles:
- Study Design and Research on Current Projects
- Website and Computer Systems Manager
- Communication and Organizational Administration
- Investigating grants and other funding

Calhoun Community College Biological Research Group Decatur, AL
Founding Team Member August 2018 – Jan 2021

- Coauthored *Assessment of Prehospital Monitor/Defibrillators for Clostridioides difficile Contamination* which was published in Cambridge University Press. I performed a literature review, drafted sections of the manuscript, responded to reviewer comments, and collected onsite samples from the patient side of the blood pressure cuffs, fingertip pulse oximeter sensors, and right arm monitor leads for multiple Lifepak 15 units at a large EMS station in Alabama.
- Collected data and contributed to the manuscript of a publication entitled *Emergency Medical Services Oxygen Equipment: A Mode of Transmission for MRSA?* published in the Emergency Medicine Journal (EMJ).
- Researched the relationship between the organelle Antia and Oncogenesis and presented at NARSEF.

PROJECTS
CPE 381 Final Project: C++ Hard-Real-Time Filter | Course Project | Fall 2021

The project had the following requirements: it must be able to implement a filter in real time that will eliminate a sine wave at 2100 Hz with an attenuation of at least 80dB for a signal that has a sampling frequency of 22050Hz.

My proposed solution to this problem was to design a Finite Impulse Response (FIR) in MATLAB's Signal Processing Tool. This tool was used to generate the FIR coefficients that my C++ program used to filter the input WAV file. I then implemented a program that will read in a WAV file specified by the user. This WAV file's properties will be examined by the program. If the program has a filter for the WAV file's sampled frequency, this filter will be used. The results are written to a modified WAV file and the user is informed.

The FIR filter is applied with real time signal processing and the results are written to an output WAV file. The FIR filter was implemented in C++ by keeping an input signal history buffer that is the size of the number of coefficients in our filter. I developed this filter and performed analysis to demonstrate that it met the requirements of a Hard-Real-Time System, meaning that the processing for each sample is completed before the next sample arrives.

I also used an open-source library to work with Fast Fourier Transforms to perform spectrum analysis of the signal provided to the program as a WAV file. Analysis was performed on each time window to determine the dominant frequency component and total power of the signal, and the output was written in a formatted CSV file.

CPE 353 Final Project: Real-time Networked Multiplayer Tank Game | Team Course Project | Fall 2021

I was part of team in my software engineering class that developed a real time multiple player video game. We developed a networked version of the Wii Tank game using a client server architecture and TCP networking protocol. The goal of the game is to avoid enemy missiles and be the last surviving tank.

CPE 348 Honors Project: Python CRC, Hamming, and Convolutional Error Correction Codes | Honors Project | Fall 2021

This honors project was a chance to explore the error detection and error correction codes in depth outside of class. I used Python and Jupyter notebook to implement the follow algorithms. I programmed a Cyclic Redundancy Check, CRC, encoder to be performed on a message before transmission and a CRC decoder that is used on the received message to test if an error has occurred. I studied and implemented Hamming error correction codes for transmitted and received messages and Convolution Error Correction Codes using a Convolutional encoder and Viterbi decoder.

CPE 325 Final Project: Human Hearing Frequency Health Examiner | Course Project | Fall 2021

An MSP 430 microcontroller was used to build a device that tests a patient's audible hearing range. UART RS-232 communication protocol is used to give the device commands from a terminal application such as MobaXterm. The MSP 430's timers and a Buzzer Peripheral was used to output the desired frequency for a specified duration. Switch peripherals were used to trigger interrupts that a patient can use to confirm that they heard the sound or to reset the device.

The program generates a report about the patient's score on the hearing exam covering all tested frequency ranges. A random delay was used to make the test results more robust, and an LCD display was used to inform the operator of the current frequency output.

Assessment of Prehospital Monitor/Defibrillators for Clostridioides difficile Contamination? | independent | March 2019 – January 2021

This study's purpose was to determine if the emergency equipment used in ambulances' patient compartment is a significant reservoir of *Clostridium difficile*, which causes morbidity and mortality. Emergency patients are especially vulnerable to infection. I worked with Calhoun Community College to on research implementation, literature review, and all parts of the publication process and am a co-author on this publication. I collected samples from the patient side of the blood pressure cuffs, fingertip pulse oximeter sensors, and right arm monitor leads for multiple Lifepak 15 units at a large EMS station in Alabama. The applicators used to collect the samples were inserted into *C. Diff* Banana Broth vials. The sealed vials were immediately transported to our lab, where they were incubated at 36°C for 72 hours. Colorimetric change from red to yellow was a positive indication for the presence of *Clostridium difficile*, which was found on 75% of the blood pressure cuffs, 95% of the fingertip plus oximeters, and 100% of right arm monitor leads. The results indicate that current disinfection protocols are insufficient.

Research Skills

I performed a literature review, drafted sections of the manuscript, resounding to reviewer responses, and collected onsite samples from the patient side of the blood pressure cuffs, fingertip pulse oximeter sensors, and right arm monitor leads for multiple Lifepak 15 units at a large EMS station in Alabama.

Space Hardware two-month project radiation detection | Independent | September 2021 – November 2021

Our UAH's Space Hardware Club project task was to design and build a weather balloon payload that would record the amount of radiation at different altitudes. This project was of special interest to me because it required our team to use engineering skills to create a device within given constraints to answer scientific hypothesizes. My desire to use engineering skills to enable answering questions that would not be possible without understanding complex systems was one of my main deciding factors in choosing computer engineering as an undergraduate major. As part of this project my team and I studied crystal scintillators and other radiation detection devices. My team and I created and

presented a Preliminary Design Review and Mission Readiness Review. Our payload successfully collected radiation data in the troposphere and the stratosphere aboard a weather balloon. The radiation data we collected confirmed the altitude to number of radiation events trend.

Research Skills

I used my computer programming skills to create the software that interfaced with the Geiger counter, barometric and temperature sensors and store data to an SD Card. I gained experience working with electronics in a technical lab and dealing with space and weight constraints.

Honors Common Good Conference | Independent | September 2021 – November 2021

The UAH Honors College hosted a conference focusing on how a nation's citizens should live in accord with the common good. I believed my engineering and research-oriented outlook would add important nuance to this discussion. My presentation was titled "Engineering Earth for the Common Good," a literature review discussing complexities of our agricultural and energy generation methods that tied both into a discussion of how improving and using technology could increase infrastructure efficiency. I proposed that our awareness of the interconnectedness of industries can innovate systems in ways that promote healthy interactions with our ecosystems and minimize pollution. I discussed vast amounts of energy that data centers consume and how innovations in cloud computing and increased algorithm efficiency can lower the amount of energy required to run the data centers that make modern life possible. This was an impactful area of study that intersects engineering, research, and the environment.

Research Skills

I wrote a proposal for the Honors Common Good Conference's Call for Papers (CFP). I used my research skills to review appropriate literature to inform my paper and speech. I presented my paper at the Honors Common Good Conference.

Emergency medical services (EMS) oxygen equipment: a fomite for transmission of MRSA? | independent | July 2018 – September 2018

This study was to determine if methicillin-resistant *Staphylococcus aureus* (MRSA) was present on surfaces of oxygen cylinders and regulators used in ambulances. Unlike most emergency equipment, cylinders must be shipped to a facility to be replenished, and there is no guarantee that an oxygen cylinder will be sent back to the same EMS station. We predicted that because oxygen cylinders are frequently distributed across state lines, MRSA colonies on oxygen cylinders serve as a fomite for virulent strains of MRSA. I collected samples from oxygen cylinders in ambulances at a local EMS station. I took samples using applicators in accordance with universal uniform area swabbing techniques. Applicators were used to culture HardyCHROM MRSA Contact Plates that determined whether MRSA was present. I assisted with data collection and created manuscript citations. We found that 67 of 70 swabbed cylinders had MRSA colonies, which led to revised disinfecting protocols spanning multiple states.

Research Skills

I learned proper surface culture collection procedures and collected MRSA samples at an EMS station in my state. I studied the journal's citation system and compiled citations. I am acknowledged in this publication. I gained research and technical writing skills that are needed in a research career.

North Alabama Regional Science and Engineering Fair project title: Induction of Crown Gall Tumors in *Arabidopsis thaliana*: Is the Novel Organelle Antia a Mechanism of Oncogenesis? | Independent | September 2018 – May 2019

I performed research to test the hypothesis that antia, a newly discovered and possibly ubiquitous extracellular organelle, is a mechanism of oncogenesis. I hypothesized this because a previous study discovered antia has a 98% genetic correlation with the HeLA cancer genome. In addition, antiae have been observed in the virulent and oncogenic strain *Helicobacter pylori* 26695, which causes cancer. I used the well-understood *Arabidopsis thaliana* as a model species and attempted to induce crown gall tumors in the plant and test for the presence of antia. I adapted and overcame large obstacles. My mentor had an emergency and could not answer my questions or provide access to equipment I needed to

complete my experiment. Nevertheless, I performed the floral dip procedure using *Agrobacterium tumefaciens* in the model species. Today this hypothesis is still unanswered, but I presented my research progress at the North Alabama Science and Engineering Fair and received an honorable mention.

Research Skills

I worked in the Calhoun labs to grow model plant species and perform the floral dip procedure. I used various lab equipment and processes such as a fume hood, incubators, and phase-contrast microscopy. I demonstrated my ability to independently adapt and overcome unexpected research obstacles. I presented my results at the North Alabama Regional Science and Engineering Fair and was awarded an honorable mention.