



# Alexander C. Sutula

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## Summary

I am an ambitious Computer Systems Engineering and Computer Science student with a strong background in cybersecurity and low-level programming, currently working on my Master's Thesis and contributing to storage research. I am passionate about solving complex technical challenges and eager to apply my knowledge in real-world applications. I am seeking to leverage my skills in either an industry development or research role and I aspire to contribute to cutting-edge projects that involve system optimization, kernel-level development, and hardware integration.

## Education

<b>B.S.E, Computer Systems Engineering (Cybersecurity)</b>	<b>Fall 2019 - Spring 2023</b>
<ul style="list-style-type: none"><li>Arizona State University, Tempe, AZ</li><li>Relevant Coursework: Data Structures, Algorithms, Digital Hardware Design, Embedded Systems, Circuit Analysis, Operating Systems, Data Forensics, Networks and Security, Computer Architecture, Software Security.</li></ul>	4.00 GPA, Summa Cum Laude
<b>M.S, Computer Science (Cybersecurity)</b>	<b>Fall 2023 - Present</b>
<ul style="list-style-type: none"><li>Arizona State University, Tempe, AZ</li><li>Relevant Coursework: Real-Time Embedded Systems, Applied Cryptography, Software Security.</li></ul>	4.00 GPA

## Technical Skills

**Programming Languages:** Proficient with Python, C, C++, Assembly; Experienced with Rust, Java, Nix.

**Programming Libraries:** Standard Template Library, Boost, Pydantic, Pandas, Numpy, Flask, FastAPI, Boto3, Pwntools.

**Software Applications:** LTSpice, Xilinx Vivado, Volatility, AccessData FTK Imager, IDA Interactive Disassembler, Valgrind, GDB and extensions.

**Hardware Applications:** Arduino/Raspberry-pi/KL46Z Microcontroller boards, Nexys A7 FPGA board.

**Compilers and Utilities:** GNU Compiler Collection, Cargo/Rustc, Git/GitHub, Jupyter, Docker.

## Professional Experience

<b>Virtualized Infrastructure, Systems, and Applications: Researcher</b>	<b>June 2022 - Present</b>
Optimizing the garbage collection performance/lifespan trade off in Zoned Namespace SSD-based caching strategies.	
<ul style="list-style-type: none"><li>The work of our team was submitted to multiple storage research conferences:<ol style="list-style-type: none"><li><b>USENIX Conference on File and Storage Technologies (FAST '23):</b> Accepted as a WIP</li><li><b>Massive Storage Systems and Technology Conference (MSST 2024):</b> Accepted poster submission</li></ol></li><li>Gained experience with kernel debugging and Linux kernel module development using the device mapper framework.</li><li>Implemented a host-side flash translation layer designed specifically to work with the constraints of the ZNS-SSD</li><li>Developed a userspace simulator to replay real-world workloads and evaluate garbage collection efficiency.</li></ul>	

## Academic/Personal Projects

<b>Audio Recorder Implemented on FPGA-based Hardware</b>	<b>Academic Project</b>
<ul style="list-style-type: none"><li>Designed audio serialization and deserialization modules leveraging combinational and sequential logic.</li><li>Integrated custom modules with existing IP memory modules for audio recording and playback.</li><li>Final solution enabled recording and playback of two seconds of audio to one of multiple selectable memory blocks.</li></ul>	
<b>IaaS and Faas Cloud-based Autoscaling and Machine Learning Pipelines</b>	<b>Academic Projects</b>
<ul style="list-style-type: none"><li>Designed multiple scalable cloud-based projects using various AWS features including S3, SQS, EC2, Lambda.</li><li>Implemented a horizontally-scaling infrastructure to dynamically start and stop EC2 instances based on workload size.</li><li>Leveraged Lambda to implement a pipeline to perform facial recognition on videos submitted via a web tier.</li></ul>	
<b>Low Level Embedded Systems Programming</b>	<b>Academic Projects</b>
<ul style="list-style-type: none"><li>Interacted with various sensors and actuators including motors, screens, accelerometers, gyroscopes, distance encoders.</li><li>Implemented various modal models on the Pololu 3pi+ 2040 Robot to navigate up and down sloped terrain and follow pre-determined paths drawn on the ground.</li><li>Implemented a game on an arm-based microcontroller using an LCD and accelerometer to direct a ball through a series of randomly generated mazes using tilt.</li></ul>	
<b>Interpretive Emulators and Debugging Tools for Old Game Consoles</b>	<b>Personal Project</b>
<ul style="list-style-type: none"><li>Implemented low-level emulators for the DMG-GameBoy and Nintendo Entertainment System in C/C++ from scratch using the SDL2 and Win32 libraries.</li><li>Implemented software replicas for various components and instruction sets to mimic hardware functionality and quirks using publicly available reverse engineering information.</li><li>Enabled step-by-step instruction tracing and memory analysis for debugging. Verified emulator accuracy using community-developed test ROMs to assess mimicry of console functionality and hardware bugs.</li></ul>	

## Other Work Experience

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### CSE330 - Operating Systems: Graduate Services Assistant

Summer 2024 Semester

- Wrote required course project specification, expected implementation, grading rubrics, and grading scripts.

### CSE340 - Principles of Programming Languages: Graduate Teaching Assistant

Spring 2024 Semester

- Held office hours to assist student's with project implementation and completion of course assignments.
- Held in-person recitations consisting of working relevant problems live to review lecture material.

### CSE330 - Operating Systems: Graduate Teaching Assistant

Fall 2024 Semester

- Wrote required course project specification, expected implementation, grading rubrics, and grading scripts.
- Contributed to the development of an automated grading infrastructure built from scratch to assess kernelspace course projects and exams.

## Activities

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### PWN.College - Capture the flag platform

January 2022 - May 2024

- Participated in a publicly available capture the flag platform run by Arizona State University.
- Practiced a wide variety of software exploitation methods across both userspace and kernelspace.
- Practiced known stack and heap corruption methods, exploitation of race conditions, reverse engineering of x86\_64 binaries, known micro-architectural exploits such as Meltdown and Spectre, and intercepting network communication.
- Earned physical blue and yellow belts as a reward for the full completion of the corresponding sets of challenges.

### PicoCTF

March 2023

- Participated in a publicly hosted Carnegie Mellon University (CMU) cybersecurity competition.
- Competed in a group of five Arizona State University students finishing in the top 1% of the global rankings.
- Practiced binary exploitation, cryptography, data forensics, reverse engineering, etc.