

James Shiffer

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Enthusiastic and self-driven research assistant eager to contribute to team success through hard work and creative problem-solving skills. Proficient in machine learning techniques, multiple programming languages, source control, code coverage, database programming, web application development, and working with global teams. Motivated to learn, grow, and excel in algorithm and software development.

Education

Sep 2020 - Jun 2024 **Computer Science and Engineering, Bachelor of Science**

University of California, Los Angeles - Los Angeles, CA

- GPA: 3.86/4.0
- Relevant coursework: Machine Learning, Deep Learning for Computer Vision (winter '24), Natural Language Processing, Speech & Image Processing, Digital Speech Processing (winter '24), Feedback Control, Digital Signal Processing, Systems & Signals, Algorithms & Complexity, Software Construction Lab, Programming Languages, Operating Systems, Computer Systems & Architecture, Discrete Mathematics, Differential Equations, Probability, Linear Algebra
- University of California Regents Scholar: awarded to the top 1.5% of incoming UCLA students.
- National Merit Scholar: awarded to the top 0.5% of eligible college-bound students in the U.S.
- Vice president of the Linux Users Group at UCLA

Work Experience

Oct 2020 - Present **Software Development Team Lead**

Electron Losses & Fields Investigation (ELFIN), UCLA

ELFIN is a student-run lab developing satellite missions to study space weather funded by the NSF and NASA.

Attitude Determination and Control Systems (ADCS)

- Led a team of 4 undergraduates to design and develop Attitools, a Python FastAPI service which manages Julia and IDL attitude simulation jobs.
- Oversaw the integration of Attitools with mission ops planner software. Managed the overall workflow where satellite operators can curate calculated attitudes through a web application.

CEPHEIDS Mission

- Designed and developed core flight software architecture for upcoming mission CEPHEIDS, including script scheduler, LittleFS filesystem abstraction layer, and magnetometer collection task. Wrote ground software test scripts. Porting flight code in C, running on FreeRTOS, to F-Prime C++ framework.
- Developing FPGA logic in Verilog for next-gen Electron Particle Detector Data Processing Unit (EDPU), EPD Master Analog-Digital Converter (D1), and Instrument Data Processing Unit (IDPU). Evaluated fabric utilization to inform FPGA trade study.

ELFIN Mission

- Maintained core Python libraries for ELFIN ground support equipment. Added support for data collection during periods when both ELFIN satellites overlapped. Optimized and refactored the pipeline for an eight-fold increase in the amount of data downloaded.

Nov 2023 - Present **Research Assistant**

Complex Networks Group, UCLA

- Evaluated the performance of DNA-ESA, a transformer model based on the BERT large language model for DNA sequence alignment. DNA-ESA is currently over 97% accurate at aligning 250-length reads onto a reference human genome of 3.4 gigabases.
- Exploring extending and enhancing DNA-ESA to other tasks such as genome assembly and cross-species sequence alignment without retraining.
- Developing an autoencoder neural network to detect low-dimensional pathological variations in sequence data.

Jun 2023 - Sep 2023 **Flight Software Applications Intern**

NASA Jet Propulsion Laboratory, Pasadena, CA

- Worked on the Vision Compute Element Flight Software (VCEFSW) for the Sample Retrieval Lander for the upcoming Mars Sample Return mission.
- Improved existing Python tools used for integration and automated testing. Added commands to leverage new features in the hardware, such as toggling SUROM write protection and retrieving and deleting data products from NAND flash. Refactored test scripts inherited from Mars 2020 mission to remove references to obsolete surface (rover) modules.
- Achieved nearly 50% unit test coverage for Computer Vision Accelerator Card Driver (CVACDRV) module in C language flight code where there were previously no unit tests.

- Jun 2021 - Sep 2022 **Software Engineering Intern**
Apton Biosystems (acquired by Pacific Biosciences), Pleasanton, CA
- Singlehandedly accelerated base calling for DNA sequencing by running a boosted trees ML model on FPGAs instead of GPUs. Integrated FPGA workers into an existing data pipeline (C#), thus quadrupling the processing rate to over 40 million samples per second.
 - Collaborated with the FPGA manufacturer in Germany to suggest features, troubleshoot and improve their proprietary software.
 - Designed and built a web analytics portal using JavaScript (Vue) to automatically query, correlate, and graphically present DNA sequencing data, thus eliminating a previously manual and labor-intensive process and allowing scientists to quickly analyze their experimental results.

Projects

- Dec 2023 **Speaker Region Identifier**
- Extracted features, such as mel-frequency cepstral coefficients (MFCCs), spectral rolloff, short-time Fourier Transform (STFT) chromagram, spectral contrast, and spectral flatness, to build a boosted trees classifier for discerning city of origin from 11 GB of American speech. Achieved over 85% accuracy.
- Jun 2023 **Kagamine Len Sleeve**
- Wearable live audio spectrum visualizer, made with a FLORA microcontroller, microphone amplifier, and custom-built LED matrix. Programmed in Processing language, with FFT library written in AVR assembly.
 - Tuned parameters to reduce background noise and assign relative weights to frequency bins, producing a natural-looking spectrum.
- Jan 2023 **Yotsuba**
- Created a Discord chatbot for generating short anecdotal stories or conversational replies from a user's prompt. Built using GPT-J language models trained on data from imageboards.
- 2018 - Present **Atmos**
atmos.warflight.dev
- Developed a new social media platform inspired by Google+, using PHP (Laravel) to build the backend and JavaScript (SvelteKit) to build a single-page app (SPA) frontend.
 - Scaled to over 1,900 users, 50,000 posts and comments, and 16,000 media uploads.
 - Delivered features such as responsive design, internationalization support, post recommendation engine, image and video uploads, lazy-loading of images, infinite scrolling, privacy customization, support for Communities (user groups) and Collections (categorization of posts), server-side caching, and push notifications to improve user experience and retention on both desktop and mobile devices.
 - Added admin tools including banning, deleting, and site analytics.

Skills

- Embedded software development, software architecture design, desktop application development, full-stack web development (frontend & backend), database programming and administration, object-oriented programming, FPGA programming, algorithm development, automated software testing, continuous integration and deployment.
- Excellent communication skills with years of remote and in-person collaboration, teaching, and mentoring experience.
- Proficient in C, C++, C#, Python, JavaScript, Java, HTML5, CSS3, SQL, and PHP.
- Practical knowledge of git, bash terminal, Win32 API, PyTorch, scikit-learn, librosa, REST APIs, AJAX, Nginx, SMTP, Vue, Node.js, MongoDB, PostgreSQL, Redis, AWS S3, Laravel, SvelteKit, LittleFS, NASA F-Prime framework, and various platforms including Windows, MacOS, Linux, and FreeRTOS.

Publications

- [1] Palla, A.; Tsai, E.; Chen, A.; Cheng, J.; Iglesias, L.; Jha, S.; King, J.; Lee, D.; Liu, A.; Liu, D.; Norris, A.; Mao, J.; Patil, U.; Sankar, R.; **Shiffer, James**; Sodani, A.; Szeto, A.; Tota, K.; Wing, G.; Ye, S.; Young, C.; Kumar, S.; Angelopoulos, V. "Expanding mission science into the inner magnetosphere with ELFIN." *AGU Fall Meeting 2021, held in New Orleans, LA, 13-17 December 2021, id. SA32B-03.*
- [2] Holur, P.; Enevoldsen, K.C.; **Shiffer, James**; Mboning, L.; Georgiou, T.; Bouchard, L.; Pellegrini, M.; Roychowdhury, V. "Embed-Search-Align: DNA Sequence Alignment using Transformer Models." (**Under review**) International Conference on Learning Representations, 2024.