

James Shiffer

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

Education

Sep 2020 – Present **University of California, Los Angeles**
Los Angeles, CA

- **Master of Science, Computer Science:** June 2025 (expected)
- **Bachelor of Science, Computer Science and Engineering:** June 2024 (GPA: 3.8/4.0)
- **Relevant coursework:** Machine Learning, Deep Learning for Computer Vision, Natural Language Processing, Big Data Analytics, Speech & Image Processing, Digital Speech Processing, Digital Electronic Circuits, Embedded Systems, Feedback Control, Digital Signal Processing, Systems & Signals, Algorithms & Complexity, Software Construction Lab, Programming Languages, Operating Systems, Computer Systems & Architecture
- **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.
- President of the Linux Users Group at UCLA

Work Experience

Nov 2023 – Present **Research Assistant**
Complex Networks Group, UCLA
DNA-ESA

- Improved the performance of DNA-ESA, a transformer model for DNA sequence alignment based on the BERT large language model. DNA-ESA achieves over 97% accuracy in aligning 250-base reads to a reference human genome of 3.4 gigabases. This rapid sequence alignment allows for more timely and cost-effective disease diagnosis.
- Investigating the application of DNA-ESA to additional tasks, including genome assembly and cross-species sequence alignment, without the need for retraining.
- Creating an autoencoder neural network to identify low-dimensional pathological variations in sequence data.

AI Observer

- Evaluating the effectiveness of the GPT-4-based Observer model in creating Generative Semantic Workspaces, which serve as a “working memory” to understand actors, roles, and states in news stories and crime reports.
- Exploring ways to improve the identification of actors and their characteristics.

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.

- **CEPHEIDS Mission:** Designed and developed core flight software architecture for the upcoming CEPHEIDS mission, including a script scheduler, LittleFS filesystem abstraction layer, and the magnetometer collection task. Upgraded the FPGA logic in the Energetic Particle Detector Analog-Digital Converter (D1) and the Instrument Data Processing Unit (IDPU). These next-generation components improve the detection of solar flares and geomagnetic storms, which can cause widespread disruptions to RF communication and power grids.
- **Attitude Determination and Control Systems (ADCS):** Led a team of four students to build Attitools, a Python FastAPI service for managing attitude simulation jobs. Oversaw the complete workflow where satellite operators can curate calculated attitudes through a web application.
- **ELFIN Mission:** Maintained core Python libraries for ground support equipment. Added support for data collection during periods when the ELFIN satellites overlapped. Optimized the data pipeline, resulting in an 8-fold increase in the amount of data downloaded.

Jun 2024 – Sep 2024 **Flight Software Intern**
Millennium Space Systems, El Segundo, CA

- Developed a Vorago microcontroller bootloader for peripherals and subsystems to be included in future generations of Millennium satellites. Added Golay error detection & correction (EDAC), allowing the bootloader to fully recover from boot image errors of up to 12.5%.
- Improved test coverage, continuous integration, and streamlined build processes across multiple flight software repositories.

- Jun 2023 – Sep 2023** **Flight Software Applications Intern**
NASA Jet Propulsion Laboratory, Pasadena, CA
- Contributed to the Vision Compute Element Flight Software (VCEFSW) of the Sample Retrieval Lander for the upcoming Mars Sample Return mission. Added commands to leverage new hardware features, including toggling SUROM write protection and managing data products on NAND flash.
 - Improved existing Python tools used for integration and automated hardware-in-the-loop (HIL) testing. Refactored test scripts from the Mars 2020 mission to remove references to obsolete surface (rover) modules. Achieved nearly 50% unit test coverage for the Computer Vision Accelerator Card Driver (CVACDRV) module in C language flight code, where no unit tests had existed before.
- 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 the existing C# data pipeline, resulting in a fourfold increase in processing speed to over 40 million samples per sec.
 - 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

- Mar 2024** **Speaker Region Identifier**
- Extracted audio features, such as gammatone frequency cepstral coefficients (GFCCs), spectral slope, and Hammarberg index, to build a boosted trees classifier for identifying the city of origin from 11 GB of American speech, achieving 95% accuracy. Implemented multiprocessing in feature extraction, resulting in a 5x speedup.
 - Augmented training data with background noise, leading to an increase in accuracy from 63% to 80% in noisy environments.
- Jun 2023** **Kagamine Len Sleeve**
- Designed and built a wearable live audio spectrum visualizer using a FLORA microcontroller, microphone amplifier, and custom-built LED matrix. Programmed in Processing, with an FFT library written in AVR assembly.
 - Fine-tuned parameters to reduce background noise and assign relative weights to frequency bins, resulting in a more natural-looking spectrum.
- Jan 2023** **Yotsuba**
- Created a Discord chatbot that generates short anecdotal stories or conversational replies from user prompts. Built using GPT-J language model, 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 application (SPA) frontend.
 - Scaled to accommodate 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 (post categorization), server-side caching, and push notifications to improve user experience and retention on both desktop and mobile devices.
 - Added admin tools including capabilities for banning users, deleting content, and accessing site analytics.

Publications

- [1] Tsai, E.; Palla, A.; Norris, A.; King, J.; Russell, C.; Ye, S.; Wu, J.; Mao, J.; Jha, S.; Young, C.; Wing, G.; Lian, K.; Szeto, A.; **Shiffer, James**; Sankar, R.; Tota, K.; Liu, A.; Lee, D.; Patil, U.; He, I.; Tam, J.; McDermott, A.; Le, K.; Kumar, S.; Nguyen, K.; Nguyen, M.; Yap, C.; Xie, E.; Tseng, J.; Roosnov, A.; Iglesias, L.; Turner, W.; Curtis, R.; Wilkins, C.; Masongsong, E.; Caron, R.; Artemyev, A.; Zhang, X.; Angelopoulos, V. "Remote Sensing of Electron Precipitation Mechanisms enabled by ELFIN Mission Operations and ADCS Design." *Advances in Space Research: Science and Applied Research with Small Satellites* (2024).
- [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).