Jeffrey S. Zhou

Undergraduate Student/Researcher at Caltech

Pasadena, CA | Grand Rapids, MI

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Technical Skills

Languages: Python, Java, Javascript, HTML/CSS, C, C++, Lua
Developer Tools: Git, VS Code, Eclipse, IntelliJ, Unity Studio, React.js, Flask, Angular, Wordpress, AWS Bedrock, Google Cloud Console, MongoDB, Google Colab, Scikit-Learn, Tensorflow, Keras
Software: Blender, Adobe CC, MATLAB, DipTrace, Altium, Solidworks, Arduino, ispLEVER, GIMP, Paint.NET

Education

California Institute of Technology Sep 2023 - Present

***B.S.**, Electrical Engineering (Intelligent Systems) - **Minor**, Data Science - **GPA:** 4.3/4.0* *Pasadena, CA*

Relevant Coursework: Electronic Systems Prototyping, Digital Logic, Embedded Systems, Discrete Math, Data Structures/Algorithms, Software Design, TensorFlow, Calculus/Linear Algebra, Physics Mechanics and E/M

Experience

Undergraduate Research Intern Jun 2024 - Sep 2024

Caltech - Space Radiation Laboratory *Pasadena, CA*

- Developed a multi-layer perceptron to identify and classify decay phases in ACE/SIS time-series flux data for solar energetic particle events, and tuned hyperparameters for optimal performance, currently 98.9% acc on target.
- Generalized MLP to analyze full ACE flight (30 years of hourly data) + other missions. Further experiment with LSTM and GRU based RNNs for finer decay pattern recognition.

Undergraduate Research Intern Jun 2023 - Sep 2023

Caltech - Graduate Aerospace Laboratories *Pasadena, CA*

- Designed/built modular engine injector test stand for hydro-patternization analysis, enabling faster testing of designs.
- Programmed hardware in C++ for 10+ components, including transducers, thermocouples, and diaphragm pumps.
- Analyzed/simulated various injector parts and improved theoretical discharge coefficient by 20% in our own design.

Software Developer Intern Jun 2022 - Aug 2022

NULL Studios *Remote*

- Refactored/revamped 5000+ lines of JSON to improve node/beam structures for in-game vehicles, improving simulation accuracy. Additionally enhanced kinematic integrators in applying differentials/integrals on motion vectors.
- Implemented impact detection feature in Lua using simulated G-sensors within game engine core.

Projects

Full Implementation of 8-bit CPU | *ABEL, Digital Logic*

- Implemented 8-bit Harvard-architecture, accumulator-based CPU in Advanced Boolean Expression Language
- CPU CU features 16-bit instruction register with decoding logic and state machine for multi-cycle instructions including CALL/RTS. Logic units and instruction set decoder total 100,000+ lines of code.

LED Blinker Board Design and Fabrication | *DipTrace, Circuit Design*

- Designed and built custom LED blinker board with 10 LEDs and various flashing patterns. Used DipTrace for schematic capture and PCB design, and FreeDFM for verification.

Full-stack Chat Application with Tuned LLM | *Python, ChromaDB, Flask, AWS*

- Developed hierarchical corpus on CS142 content, integrated with a graph-based RAG system for context-awareness.
- Reduced query cost by 98% by optimizing more efficient LLM through fine-tuning/prompt engineering via GPT API

Lofi Roguelike Pixel Shooter Game | *C, SDL*

- ROTMG-inspired game with intelligent enemies, attacks, and custom sprites, UI, unit tests, and physics engine.
- Written entirely in C using only standard library functions and SDL (for graphics rendering), totaling 6000+ lines.

Fresh and Rotten Fruit Identification | *Python, Tensorflow*

- Deep neural network trained on labeled dataset of fresh/rotten fruits; post fine-tuning, achieved $> 98.8\%$ accuracy.