Henry Wang

h352wang@uwaterloo.ca | hwang2409.github.io | henry-w-se | hwang2409

Technical Skills

Languages: C, C++, Java, Python, JavaScript, SQL, HTML/CSS
Developer Tools: Git, Docker, PyCharm, Vim, IntelliJ, Eclipse, LaTeX
Frameworks & Libraries: TensorFlow, PyTorch, NumPy, Matplotlib, SDL, React, Node.js, Express.js
Machine Learning & AI: Natural Language Processing (NLP), LLM Integration, Classification Models

Projects

hang.ai | *Python, Next.js, PostgreSQL, PyTorch, Docker* | Aug. 2025 – Present

- **AI-powered note taking app** that generates personalized explanations and quizzes for students.
- Trained a **custom sequence-to-sequence neural network** for **speech-to-LaTeX** conversion, using **spectrogram features**, **attention mechanisms**, and **CTC decoding**.
- Integrated **LLMs** for semantic question answering and fine-tuned prompt pipelines to improve response accuracy.
- Deployed with **Docker**, adding **JWT-based** authentication and **PostgreSQL** storage for production.

3D Software Renderer | *C, SDL2* | Dec. 2023 – Present

- Built a **software renderer** for real-time generation and interactive user navigation around **3D objects**.
- Implemented advanced features including **mesh rendering**, **smooth shading** and **orthogonal projection.**
- Developed supporting data structures from scratch (e.g., **AVL Trees**) to support the run-time efficiency of complex algorithms (e.g., **Bentley-Ottman algorithm**).

Retro Video Game Console | *Python* | Oct. 2024 - Dec. 2024

- Collaborated in 5-member team to develop a retro-style **8-bit game console** from the ground up.
- Implemented a **hardware abstraction layer** to enable seamless communication between software and a custom **16x12 RGB display**, keyboard input, and a 3-channel, 1-bit audio system.
- Deployed 3 fully functional retro games: Tetris, Snake, and Sokoban to showcase the console's capabilities.

Neural Network Framework | *C++* | Aug. 2024 – Nov. 2024

- Built a **C++ machine learning library** for building and training custom neural networks.
- Enabled full customization of loss, activation, and architecture using **templating** and **function pointers**.
- Added support for optimizers including **Adam** and **SGD**, improving training performance and flexibility.
- Validated the framework on the **MNIST dataset**, reaching **98.2%** accuracy across **10,000 handwritten digits.**

Experience

Software Engineer Intern Apr. 2025 – Aug. 2025
NationGraph *San Francisco, CA*

- Built full-stack features with **React** (**TypeScript, Redux**) and **Python** (**FastAPI, PostgreSQL**), delivering scalable REST APIs and optimizing UI performance.
- Improved **PostgreSQL** performance by **38%** using **B-tree indexing**, **join refactoring**, and **Redis caching**.
- Deployed a large-scale **ML pipeline** to classify and normalize **600M+** vendor names across homogenous datasets, enhancing data consistency and analytics using **TF-IDF** and **supervised classification models**.

Autonomous Software Developer Oct. 2024 – Present
WATonomous *Waterloo, ON*

- Developing core autonomy software for a Rover, improving self-directed navigation and real-time object detection.
- Implementing **YOLO-based** object detection and **SLAM algorithms** to achieve real-time environmental mapping for completely autonomous navigation.

Education

University of Waterloo Sept. 2024 - Apr. 2029 (Expected)
Bachelor of Software Engineering (BSE) *Cumulative Average: 93% (4.00 GPA)*

Awards

National Champion for Hypatia Math Contest (1/5627)
Score of 124.5 on AMC12 2024 (Top 5% out of 140,000 participants)
Bronze Medal on the CLMC