

ETHAN SUN

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Education

University of Waterloo - Waterloo, Ontario

Sep 2025 – Present

BCS, Honours Computer Science with Co-op

GPA: 3.9

Relevant Coursework: Functional and Imperative Programming, Linux CLI, Shell Scripting, Git Version Control, Automated Testing, Build Automation, Cryptography

Technical Skills

Languages: Python, Java, C, HTML/CSS, JavaScript, SQL, Swift

Technologies/Frameworks: React.js, Node.js, Next.js, Express.js, Pytorch, Pandas, NumPy, Scikit-learn

Tools/Skills: Docker, PostgreSQL, Git, Github, Linux, Bash, FreeRTOS, ESP32

Projects

AI Mind Mapping Web App 🗄 | *React, Node.js, Next.js, Express.js, PostgreSQL, Docker*

- Built a **full-stack web application** across **4 Dockerized microservices** — **React** front-end, **Node.js/Express REST API**, **PostgreSQL** database, and a **Python FastAPI AI service** for a reproducible environment.
- Constructed an **AI-powered insight engine** using **OpenAI Embeddings** and **GPT-4o** to compute cosine similarity between nodes, surfacing the top **5** semantically related connections to show users non-obvious idea relationships.
- Strengthened security with a **server-side session authentication** with **httpOnly cookies**, **bcrypt** password hashing at **12 salt rounds**, and a **RESTful API** across **8** endpoints enforcing session validation for user data access.

F1 Telemetry Driver Performance Analysis 🗄 | *Python, Pandas, FastF1, scikit-learn, NumPy, Matplotlib*

- Built an **end-to-end Machine Learning (ML) pipeline** in **Python** to ingest, clean and preprocess F1 qualifying telemetry via the **FastF1 API**, engineering speed, throttle and braking features from **4,446** driver comparisons.
- Trained a **Random Forest** regression model to predict lap-time deltas between driver pairs, achieving a **MAE** of **0.223s** and **R²** of **0.72** outperforming a hand-tuned weighted baseline model in prediction accuracy.
- Ensured rigorous evaluation by using **GroupShuffleSplit** to hold out **5** complete race weekends as the test set, preventing data leakage between sessions from the same event.

LazyPaste 🗄 | *JavaScript, Google Docs API, OpenAI API*

- Designed and implemented a **Manifest V3 Chrome Extension** in **JavaScript** that integrates a **LLM** via the **OpenAI API** directly into Google Docs, delivering context-aware text generation and summarization without leaving the editor.
- Improved extension reliability by implementing **OAuth2** authentication via **chrome.identity** and chunked text insertion via the **Google Docs batchUpdate API**, ensuring accurate AI output within the document.

Experience

Electrium Mobility

Sep 2025 – Dec 2025

Firmware Developer

Waterloo, Ontario

- Engineered a **C++ UART/BMS API** that streams real-time pack voltage, current, temperature, and cell data at **50Hz** enabling reliable low-latency telemetry communication across an embedded Linux-based **ESP32** system.
- Improved embedded system reliability under load by developing a **FreeRTOS**-based multi-threaded **data pipeline** for **BMS** and **VESC** sensor ingestion, validation, and output, eliminating data loss during processing.
- Delivered $\pm 2\%$ accuracy in speed and distance metrics by implementing signal processing logic that converts raw **VESC** motor RPM into actionable user-facing performance metrics delivered in real-time.

Spark Youth Robotics - FRC Team 8728

Aug 2023 – Apr 2025

Mechanical Member

Ottawa, Ontario

- Increased robot scoring capability by designing and building a 3-stage elevator system, using **CAD** and precision fabrication tools, enabling the robot to reach targets across all competition field heights.
- Improved game piece acquisition reliability by designing and iterating on a coral intake funnel through rapid **prototyping**, physical **testing** and performance driven design refinements across build cycles.
- Maintained **100%** uptime at competition by collaborating across mechanical, electrical, and programming teams to systematically diagnose and resolve failures under strict time constraints, ensuring **zero** failures in between matches.

Awards / Extracurricular

- **President's Scholarship of Distinction** - Uni. Waterloo Computer Science
- **Merivale HS Vex Robotics** Mechanical Team Lead and Robot Driver
- **Marauder's Cup** and **2024 NCSSAA Championships** event coordinator
- **Baseball Ontario** district and provincial level umpire