

Education

College of Computer, Mathematical, & Natural Sciences, University of Maryland
B.S. in Computer Science, Minor in Statistics

College Park, MD

Work Experience

Peloria, Artificial Intelligence Research Group

Fullstack Engineer

Washington, DC

February 2024-Present

- Engineered a WebGL-based real-time rendering pipeline to visualize historical, biweekly satellite imagery across 70 regions of interest. Built an image processing server to convert and compress large geoTIFF images from Google Earth into optimized PNG formats, significantly enhancing rendering speed and performance in the browser. Implemented a custom caching mechanism to avoid redundant and expensive queries, ensuring smooth, real-time user interactions.
- Developed dynamic dashboards using React and D3, along with an internal GeoJSON SVG library, to visualize regional data (crime, migration, birth rates), enhancing data presentation and insights.
- Collaborated with World Bank to build APIs and infrastructure tailored to client-specific needs, improving data accessibility and utility.
- Developed web crawler and ETL pipelines, utilizing Llama 3.1, to process language data and build migration prediction models.

Learn Prompting, eLearning Platform for Prompt Engineering

Lead Fullstack Engineer

College Park, MD

December 2023-May 2024

- Spearheaded the migration of a Webflow proof of concept to Next.js, optimized SEO, and configured CI/CD pipelines with Vercel and error-tracking tools (Posthog and Sentry), enhancing performance, scalability, and workflow efficiency.
- Created transpiler to automate migration of existing prompt engineering courses from markdown to MDX
- Developed and deployed a RAG chatbot and an LLM playground for interactive prompt engineering learning, and implemented a robust authentication system with rate limiting, whitelisting, and blacklisting features.
- Created an accessible and responsive internal component library using shadcn and Tailwind CSS, and automated build processes and workflow management, including GitHub Actions-based integration testing.

Fannie Mae, Single Family Analytics, Distressed Assets Team

Machine Learning Intern

Washington, DC

June 2021 – August 2021

- Designed and implemented deep learning models using PyTorch, NumPy to improve the accuracy of loan underwriting risk assessments, utilizing techniques such as neural networks and gradient boosting to enhance prediction reliability.
- Developed regression models with PyTorch and NumPy to accurately estimate the replacement costs of foreclosed properties. These models incorporated features like property condition, market trends, and geographic factors to optimize resource allocation.
- Created classification algorithms leveraging PyTorch to assess whether foreclosed homes should be sold as-is or with repairs. The models used factors such as repair costs, local housing demand, and time-on-market predictions to maximize profitability while minimizing holding costs.
- Designed interactive Tableau dashboards to provide real-time analysis of foreclosure property data, enabling stakeholders to make more informed decisions through enhanced visualization of key metrics and trends.

Projects

Drone Studio

Individual

October 2024 - Present

- Zig, C/C++, Raspberry Pi (Zero 2W), MPU-9250, libavcodec, OpenGL, NTP, UDP/RTP, Linux Networking, Madgwick Filter, 3D Printing
- A real-time visual SLAM system for drones using stereo cameras for depth estimation. Streams synchronized video frames over a custom Wi-Fi access point to a server, decodes them with hardware acceleration, and fuses camera-based visual odometry with IMU data to dynamically render a 3D environment.

Features include:

- Stereo camera using Raspberry Pi cameras with NTP-based frame synchronization for depth and pose estimation.
- Low-latency video streaming pipeline leveraging UDP/RTP and hardware-accelerated H.264 decoding via FFmpeg.
- Madgwick filter for robust sensor fusion, enabling real-time orientation updates in OpenGL-based rendering
- Ongoing development of PID loop using estimated Pose to obtain Roll, Pitch, Yaw and Throttle needed to reach desired location

3D Scanner

Individual Project

July 2024 – September 2024

- C, ESP32, React, Three.js, Zig, VL53L1X LiDAR, NEMA 17 Stepper Motor, A4988 Stepper Motor Controller, Git
- Developed a high-resolution 3D scanner to capture detailed point clouds and meshes of physical objects

Features include:

- Programmed the ESP32 firmware in C to interface with the VL53L1X LiDAR time-of-flight sensor and control the NEMA 17 stepper motor using the A4988 controller.
- Created TCP server in Zig to communicate and process distance data from the ESP32, enabling real-time generation of height maps.
- Developed a React and Three.js-based web app to visualize scanned objects in 3D, providing an intuitive interface for users to operate with the scanner and interact with the scanned data
- Achieved a scanning resolution of 2mm² and a scan time of approximately 1 minute for objects up to 8.6cm in height.
- Planning to integrate photogrammetry techniques with the height maps generated from LiDAR data to improve scanning accuracy and detail.

Skills and Interests

Languages: TypeScript, JavaScript, Next.js, Java, Python, C, C++, SQL, HTML/CSS, Go, Zig, Rust

Frameworks: Linux, React, Node.js, Next.js, Express, Redux, PyTorch, Numpy, TensorFlow, OpenCV, CUDA, Selenium, Flask, FFmpeg

Tools: Docker, Git, GitLab, AWS, Azure, GCP, Slurm, Tableau, GDB, GCC, LLVM,