Joseph Ma

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Visit portfolio

Education

Purdue University, College of Engineering – ***West Lafayette, IN***

Master of Science in Electrical and Computer Engineering - December 2025

- Graduate Teaching Assistant for Microprocessor Systems and Interfacing

Bachelor of Science in Computer Engineering - May 2023 *GPA : **3.83**/4.00*

- Undergraduate Teaching Assistant for Electrical Engineering Fundamentals, Advanced C Programming, Data Structures

Work Experience

Amazon Robotics **January 2025 - June 2025**

Incoming Embedded Firmware Engineering Co-Op *North Reading, MA*

The Walt Disney Company **May 2024 - August 2024**

Attractions Engineering Intern - IoT and Embedded Systems *Hong Kong*

- Engineered and led the development of a monitoring and data acquisition system for a Disneyland boat ride using an **ESP32**, capturing over **16 critical measurements**, including location, speed, engine RPM, water temperature, oil pressure, and fuel levels. Utilized **I2C** and **SPI** for peripheral communication and applied signal conditioning techniques to enhance data accuracy.
- Prototyped the circuit system on a breadboard, iterated and tested through multiple versions, and finalized the design on a PCB for mass production. Successfully deployed the system on **22%** of the ride, enabling 24/7 monitoring and real-time data transmission via **LoRa** to a central gateway whenever a boat is active.
- Configured LoRa protocols on the ESP32, programmed and optimized gateway settings for efficient data reception using **UDP**. Developed **Python** scripts utilizing **TCP** protocols and API keys for reliable data transfer from the gateway to a NAS (InfluxDB), enabling continuous data logging and remote monitoring - even from offsite - providing real-time data and precise boat location—insights previously inaccessible unless observed directly.
- Prepared data for potential use in Machine Learning, including **Recurrent Neural Networks (RNNs)** to predict and prevent engine failures. The system is estimated to **reduce engine downtime by 50%** and is projected to **increase ride capacity by 23,000 guests annually**. Framework set for mass deployment across the entire ride.

Purdue University School of Electrical and Computer Engineering **January 2024 - December 2024**

Graduate Teaching Assistant - Microprocessor Systems and Interfacing *West Lafayette, IN*

- Led lab sessions using **STM32 ARM Cortex-M** microcontrollers, focusing on Embedded **C** and **Assembly** programming, **DMA**, and **ADC/DAC** interfacing. Introduced basic **RISC-V** assembly, concentrating on load and store instructions, stack operations, and instruction set architecture (ISA) usage.
- Instructed on **SPI, I2C, and UART** communication protocols and techniques such as **PWM** emphasizing their application and implementation on ARM platforms.
- Evaluated student projects and labs involving interrupt service routines, timer configurations, and memory optimization in real-time operating systems, focusing on efficient peripheral interfacing using ARM architecture.

Projects **See joseph-ma.com for a full range of projects with interactive demos.**

Cat and Mouse - Reinforcement Learning **April 2024**

- Developed a pursuit-evasion model using A* for a deterministic cat agent and wrote a **Q-learning algorithm from scratch** for an adaptive mouse agent. Created a user interface allowing any user to train their own RL agent in real-time and implemented a double DFS algorithm to deepen the mouse agent's understanding of dead ends.

Neural Network Architecture - Supervised Learning **March 2024**

- Authored a comprehensive guide on neural network architecture, developing a neural network from scratch and deriving detailed explanations for each step, including forward propagation, backpropagation, and gradient descent, to visualize the underlying mathematical principles.

Skills

Languages: Expert: C/C++ | Python | Proficient: Assembly | Java | HTML/CSS/JS | MATLAB | Basic: SystemVerilog
Software: Unix/Linux | TCP/IP | HTTP/HTTPS | CI/CD | Git | GDB | Valgrind | RTOS | LTspice
Hardware: STM32 (ARM cortex) | RISC-V | I2C/SPI/UART | DMA | ADC/DAC