

JOSEPH MA

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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

- Oversaw lab sessions involving **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.

RTOS based Sensor Data Logger

June 2024

- Developed a **FreeRTOS**-based **multithreaded** system with an ESP32 to test the accuracy and precision of photoelectric sensors by controlling a stepper motor for consistent, high-speed measurements. Used an **interrupt-driven ring buffer** for real-time logging of sensor data to an SD card, ensuring **thread-safe task synchronization** and solving data loss issues.

Cat and Mouse - Reinforcement Learning

April 2024

- Designed 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 developed a double DFS algorithm to enhance the mouse agent's ability to recognize and navigate dead ends.

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