PHOEBE LUO

in/phoebe-luo/ phoebeeluo

phoebeeluo.com
647-766-1842
phoebe.luo@uwaterloo.ca

SKILLS

- Multidisciplinary knowledge of mechatronic systems through industry experience in fields from robotics to AI accelerators
  - **Languages:** C, C++, Python
  - **Platforms:** STM32, nRF52, ESP32, ARM, RISC-V, Linux
  - **Tools:** GDB, Logic Analyzer, Joulescope, Oscilloscope, MATLAB, Git, CMake, Jupyter Notebooks
  - **Communication Protocols:** SPI, I²C, UART, BLE
  - **Frameworks:** FreeRTOS, Zephyr, ESP-IDF

EXPERIENCE

System Software Intern │ _Untether AI (Acquired by AMD)_   May 2025 - Sept 2025

- Developed system software for at-compute memory architecture on custom **RISC-V** AI accelerator hardware
- Refactored a monitoring subsystem in **FreeRTOS** by centralizing peripheral access and pruning inefficiencies with inter-task communication, establishing a cleaner task ownership model and reducing latency
- Improved a custom dynamic voltage and frequency scaling (**DVFS**) system that adjusts operating points based on real-time thermal data for optimizing performance under heavy inference workloads, while maintaining safe temperature threshold
  - Developed hysteresis-based control logic within the DVFS feedback loop to eliminate oscillations between voltage-frequency states, improving state transition stability and energy efficiency in AI inference pipelines
- Worked on HIP runtime layer within AMD's ROCm stack by rewriting kernel launch latency performance tests in **C++** to differentiate runtime scheduling overhead from GPU execution latency, using host wall-time vs. HIP event timing to improve test accuracy

Embedded Software Developer │ _Adhawk Microsystems (Acquired by Alphabet)_   Apr 2024 - Aug 2024

- Wrote, debugged, and tested firmware for **eyetracking consumer wearable** based on two **ARM** Cortex MCUs
- Developed a platform-agnostic **embedded SDK** in **C**, implementing board support packages (BSPs) for **STM32**, **nRF**, and **ESP32** based systems compatible with **Zephyr** and **FreeRTOS,** enabling customers to easily integrate Adhawk eyetracking wearable
- Collaborated across teams to ship new hands-free calibration feature on **nRF MCU** via **BLE**, reducing user onboarding time by 7%
- Increased battery life by 10% by optimizing **BMS** through various fixes including characterizing abnormal behaviour with a **joulescope**, battery simulation circuits, and then implemented new battery management schemes in **Zephyr**

Camera Engineering Intern │ _Tesla, Inc_   Sept 2023 - Dec 2023

- On the **Autopilot Electronics Product Design (AEPD) team** for electromechanical integration of camera sensors on cars & Optimus
- Built two software tools from scratch which automated **image processing**, analysis, and validation of large camera testing datasets using **Python** and **MATLAB** libraries, resulting in a 91% reduction in time needed compared to previous workflows

Embedded Systems Intern │ _Gastronomous Technologies_   Jan 2023 - May 2023

- Prototyped and deployed mechatronic subsystems for kitchen automation robots used in the fast food industry
- Designed real-time temperature logging system using **CubeMX** to configure **STM32** peripherals such as **SPI** and timers, which enabled data-driven tuning of thermal parameters, reducing product cycle time by 5%

Robotics Research Assistant │ _The Hospital for Sick Children (SickKids)_   May 2022 - Aug 2022

- Implemented **electronic beam steering** of an ultrasound transducer for motion compensation during focused ultrasound cancer treatments, achieving positional accuracy of ±2 mm; recognized as second author on published paper

PROJECTS

camagotchi │ _ESP32, System Design, Hardware_

- Designed mini IOT camera (in a Tamagotchi form factor), targeting 4× resolution of leading market competitors in same size class
- Reduced image transfer latency by 95% through codebase refactor to use **real-time** architecture, **buffering** schemes, and **DMA**
- Implemented custom **SMTP** client in **C** for **Wi-Fi**-based transfer of high-resolution JPEGs
- Wrote **bare-metal I²C** driver for accelerometer using register map and timing constraints from datasheet
- Integrated **SPI** camera and SD card modules using **ESP-IDF** platform and **FreeRTOS** task model

EDUCATION

University of Waterloo │ _Mechatronics Engineering, BASc - 3.8 GPA_   Sep 2021 - Apr 2026 (expected)

Nanyang Technological University │ _Electronics Engineering (Academic Exchange)_   Aug 2024 - Dec 2024

INTERESTS

- Birds/Dogs
- Finishing the NYT Mini Crossword in < 20 seconds
- Food Reviewing and Cooking
- Photography

HELLO WORLD!
I'M PHOEBE AND THIS IS MY

PORTFOLIO

A GENERALIST WHO DOES A LITTLE BIT OF EVERYTHING

Despite my professional interests being specialized in embedded + system software, I'm a hacker at heart who LOVES making wacky embedded projects that have never existed before — I like a challenge where I can leverage my ability to take an idea and turn it into a fully fledged product. This means I have skills in mechanical, electrical, embedded, and software disciplines — not to mention being a quick learner — which will be evident as you go through this portfolio :)

I'm currently looking for full time work at a company that will help me become a great system software engineer through mentorship and meaningful work :)

Camagotchi

A CAMERA AS SMALL AS A TAMAGOTCHI

Inspired by a trend of bag charms + my love for old school consumer electronics like the Tamagotchi, I wanted a camera in that same form factor. I was essentially challenging myself to build the tiniest camera interface possible at the highest possible photo quality.

As a maker I love projects that start from an idea to a full fledged product, and as a bonus I reaaaaally want this for my own bag charm collection >:)

Currently prototyping Ver. 1 where I interface OTS parts, eventually will be custom PCBs 👌

STARTING FROM SCRATCH

My #1 design rule is always start at the user and fully define the requirements. Below are some of the driving criteria for everything in this project

REQUIREMENTS
- *Device must fit in the palm of my hand*
- *Image quality needs to be better than other small digi-cams on the market*
- *Want a satisfying user experience with tactile inputs*
- *Wirelessly transmit photos to my phone*

I then translate requirements into specifications, notably:

SPECIFICATIONS
- *Ideal dimensions for entire product under 60 mm x 60 mm x 35 mm*
- *Camera module quality must be over 4 MP*
- *Clickable button*
- *MCU must have BLE or Wifi built in*
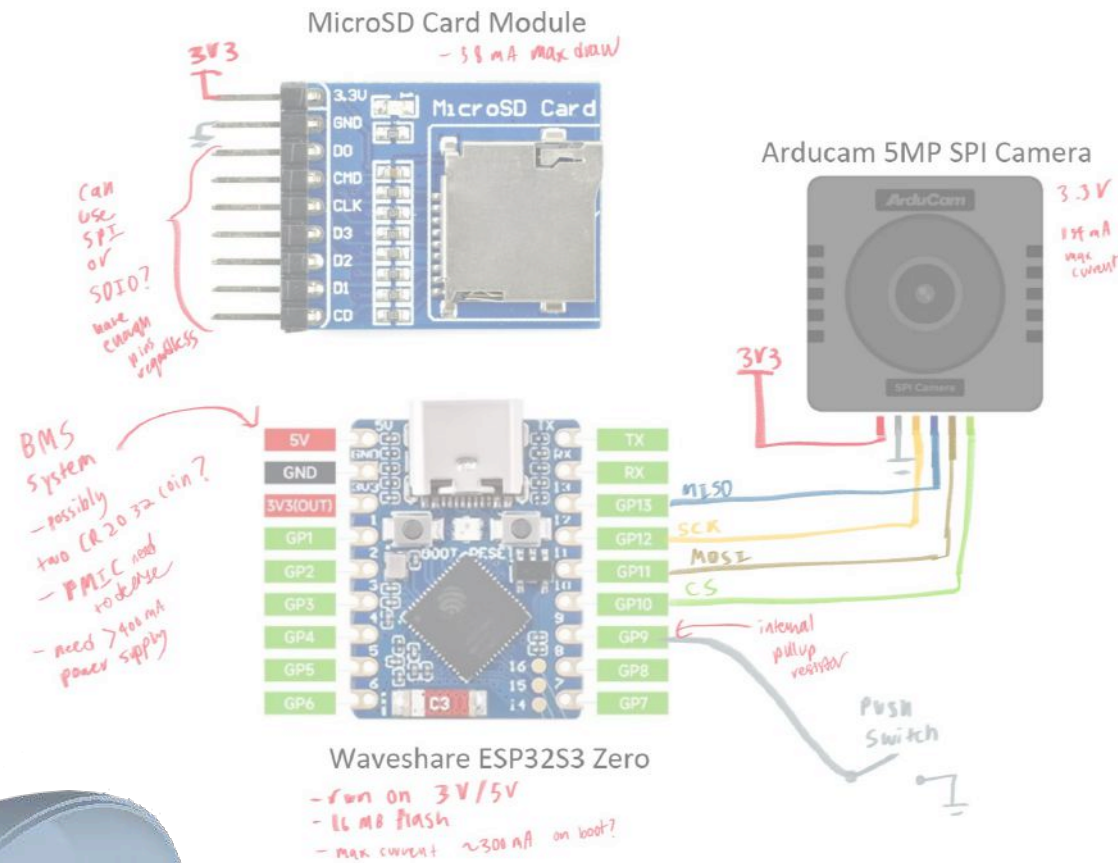
SYSTEM DESIGN

Pictured (left) are rough sketches of the system after I defined specifications, where I determined voltage, current, hardware, and memory constraints.

This helped me source components, such as picking the ESP32S3 Zero as my main MCU for its tiny size + wireless capabilities, and a 5MP camera that can communicate over 4 wire SPI.

CAD

Being able to pull from my interdisciplinary knowledge of DFM, surface modelling, and camera design (thanks Tesla internship!) was very useful here.

Spent a long time thinking about the interfaces between the electronics and assembly, and how to package so much into the smallest possible product.

WHATS NEXT?

I am actively working on this project! I just refactored my v1 firmware to a real-time architecture and reduced image data transfer latency by 95%. Lots of iterations to come as I make the system smaller, faster, and more power efficient :)

The goal is to have a polished product that I can use as a stylish and functional bag charm.