MAHIR MAHOTA

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EDUCATION

University of Waterloo – Candidate for BASc in Mechatronics Engineering   Sept. 2022 – April 2027
GPA: 3.99/4.0 (93.57% Cumulative) – 5x Dean's Honours List and Academic Representative
Relevant courses – RTOS (C), Microprocessor systems (C), Digital Computation (C++), Data Structures (C++)

WORK EXPERIENCE

Firmware Engineering Intern   May 2025 – Aug. 2025
Studica Robotics
- Developed bare-metal flash interface to emulate EEPROM on an STM32H533, enabling user data storage
- Designing MEKF in C for 9-axis IMU with varying sensor data rates, allowing real-time attitude estimation
- Implemented CAN FD driver with dynamic payload sizing and BRS detection for backwards compatibility

Firmware/Embedded Engineering Intern   Sept. 2024 – Dec. 2024
Siemens
- Improved BLE GATT server and client scripts used to communicate mock sensor data, enabling server control through async socket streams, allowing client reconnections and reducing code size by 40%
- Implemented sensor BLE command handlers, defining custom packet format to fetch manufacturer data
- Migrated CI/CD pipelines, moving dockerized builds from Jenkins/Bitbucket to GitLab, saving $60k a year

Embedded Software Developer Intern   Jan. 2024 – Apr. 2024
Christie Digital Systems
- Designed embedded software in C and C++ for master control and regulation boards on venue projector
- Generated varying software PWM with a PIC24, enabling sinusoidal wave creation to drive piezo actuator
- Enabled manual control and display of dichroic wheel RPMs through a CLI, allowing for finer speed control
- Automated schematic netlist file parsing to error check 16k+ pin connections, saving up to 6 hours/week

Firmware Developer Intern   May 2023 – Aug. 2023
onsemi
- Developed firmware and test suite in C and C++ for multi-phase voltage controller used in cloud servers
- Multithreaded tests to validate concurrent driver functionality, better approximating real time behaviour
- Conducted tests for 15+ drivers and a PMBus library with 94% coverage, using GDB for debugging issues

DESIGN TEAMS

Firmware Team Lead   Jun. 2023 – Aug. 2024
Waterloop
- Directed 14 active members to develop software for a custom-built hyperloop pod used in competition
- Created a three-phase motor controller driver in C for closed-loop PID control of the LIM through a DAC
- Developed CAN driver and config files for RPi and F767ZI modules to communicate using the STM32 HAL
- Designed two-layer PCB in Altium to multiplex 48 thermistors, reducing ADC channels in BMS by 87.5%

Vehicle Platform Director   May 2024 – Jan. 2025
WATonomous
- Managed 15+ active members to develop hardware and firmware to turn a Kia Soul EV fully autonomous
- Developed C++ interface layer to translate ROS2 messages from the autonomy stack into CAN frames

SKILLS

Software: C, C++, Python, Linux, Bash, RTOS, Git, GDB, CMake, ROS2, Docker, MATLAB/Simulink, VHDL
Tools and Technologies: STM32, PIC, ESP32, Raspberry Pi, Arduino, OpenCV, TensorFlow, Pandas, NumPy
Electrical: Altium, Oscilloscope, Logic Analyzer, DMM, Soldering (THT/SMD), Hot Air Reflow
Protocols: CAN (2.0, FD), I2C, SPI, UART, USB 2.0, I3C, SMBus/PMBus, BLE
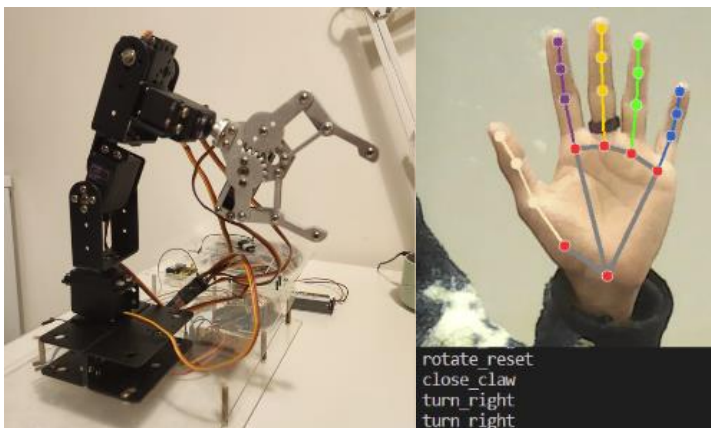
PORTFOLIO
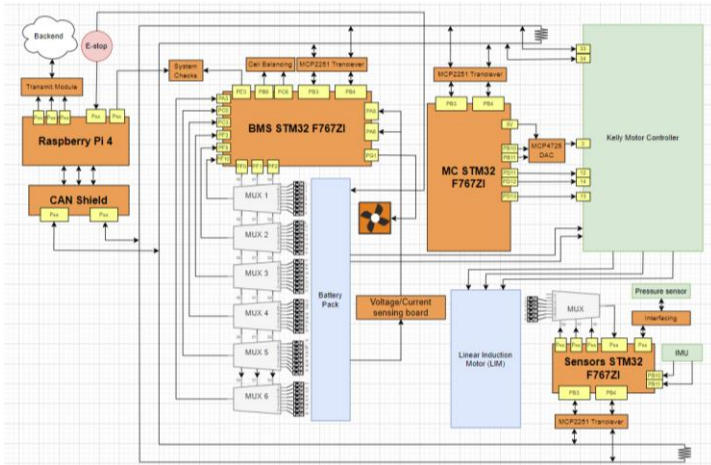
Waterloop Pod

- Led team to develop competition ready firmware for motor controller, BMS and sensor sub-systems to interface together.

- Developed CAN communication frameworks for STM32 7676ZI boards to send messages and warnings to a central Raspberry Pi.

- Worked on driver to control the 140V-600A motor controller through an external DAC.


OpenCV Robotic Arm

- Transferred OpenCV hand landmark coordinates into an array to detect when finger or hand positioning changed. These defined servo positioning commands for the MCU sent through the Bluetooth module.

- Wired six servo motors to properly support their stall current. Soldered servo control wires and the HC-05 to the microcontroller, enabling wireless communication in Python.
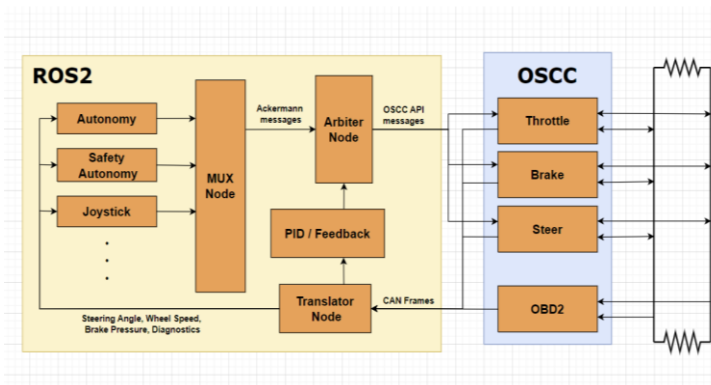

WATonomous Car

- Designed architecture for the physical interface and the ROS2 nodes allowing CAN communcation with the Kia to allow for joystick and autonomous control.

- Implemented power system infrastructure to power the sensor and compute racks using the car battery and DC/AC inverters.
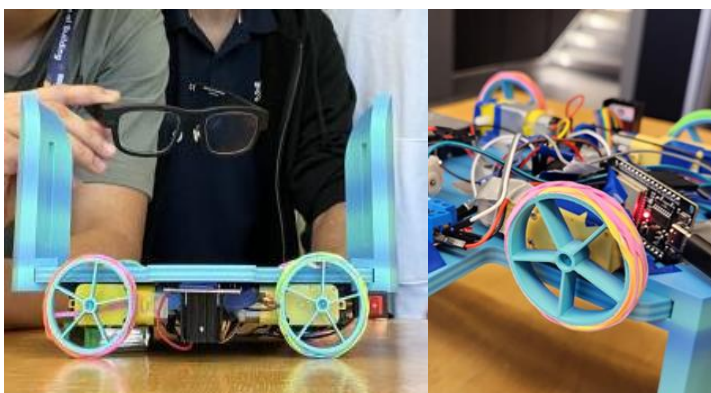

Eye Controlled Trolley

- Cleaned accelerometer and gyroscope data by polling at fixed intervals, averaging values and correcting for drift inaccuracies.

- Had the ESP32 drive four DC motors through two H-bridges, using the onboard WiFi module to send commands directly from the Python script wirelessly.
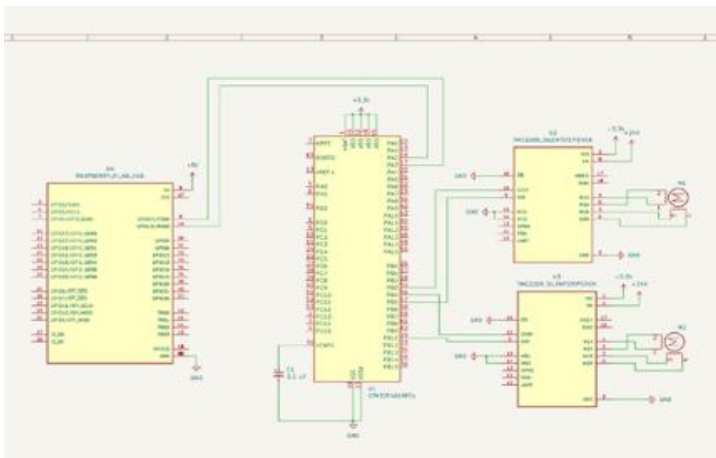
Brick Scanner

- Wrote object-oriented C++ driver for controlling a NEMA-17 stepper motor with an STM32 NUCLEO-F401RE. Added micro stepping capabilities for increased resolution. Two motor objects were defined to move a camera arm.

- Set up communication with RPI using UART and interrupts for important messages such as when the next measurement was urgent.
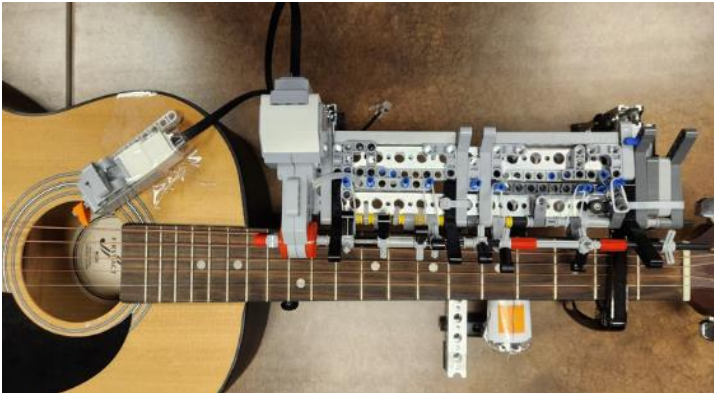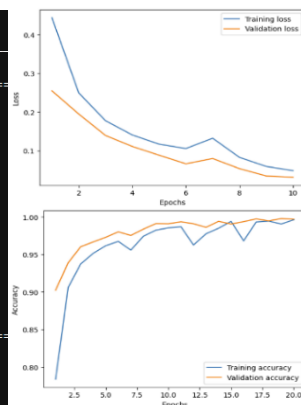
Guitar Playing Robot

- Wrote drivers in C for colour reading, fretting, and strumming. Used colour and ultrasonic sensors to detect progress of tasks. Designed for first year design project.

- Built camshaft system to press on the string at different frets depending on the angle a motor is rotated. The rotation of the motor was tracked using onboard motor encoders

Movie Reviews Discord Bot

- Created NLP model with TensorFlow using 50K IMDb reviews. Processed data by vectorising and creating a pipeline with separate training and validation sets.

- Interacted with the Discord API to get access to user messages. Programmed a web-scraping script that collects URLs from a Google query search and extracts text.

OpenCV Wheel Tracking

- Developed program in sub 12 hours for wheel detection instead of current standard of mechanical triggers, improving accuracy. Applied Hough transforms and contour detection snippets.

- Adapted depth camera for Python instead of C++ using WSL, allowing easier detection of stickered holes in the car chassis.