

San Francisco, CA **Mytra** 2025 May - December

Robotics Intern (Co-op), under Jonathan Pyke

Automated Storage and Retrieval Robotics
85% of my time was spent writing and testing Firmware

What I did:

- Developed **firmware** for a rapidly changing project, utilizing **test driven development** and **modern C++** standards.
- Proposed and **implemented refactors** when priorities permitted, **helping mature the new codebase** into a robust foundation for future development.
- Implemented and monitored **alarms** to **predict hardware failures** by detecting patterns in sensor data. Resulting in the **identification and mitigation** of a major **hardware issue**.
- Evaluated**, tested and **recommended new technology** during a major hardware iteration so the next generation of product better meets the company's goals.
- Implemented safety-critical systems using Beckhoff PLCs to separately detect forklifts and humans, ensuring our project was safe for our users, engineers and technicians.



Idle bot in structure (From company's website)

[Company Website](#)

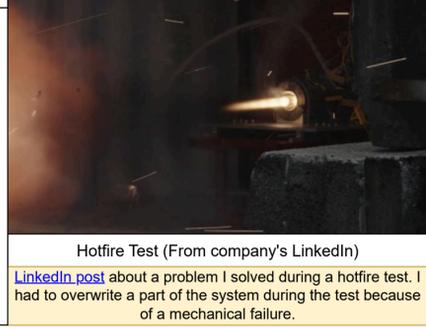
Vancouver, BC **Moon and Mars Industries** 2024 January - August

Avionics Engineer (Co-op), under Bruno Geoffrion

Suborbital rocket development and testing of liquid rocket engines.
Avionics = Mix of electronics and software.

What I did:

- Reworked control room **PLC** software and ignition hardware to **enable the company's first hotfire test**. This included the hotfire sequence, alarms, aborts, ignition detection and sensor calibration, all separate to flight code and flight hardware.
- Wrote** flight computer **firmware** for a suborbital rocket. I was responsible for the **solenoid actuation**, automated sequences, **communication** and the **global state machine**.
- Integrated avionics and propulsion** systems for hotfire tests, requiring a **solid understanding of the mechanical system**. Participated in design reviews and collaborated with the mechanical team to ensure my code operated safely.
- Hired for avionics but **contributed across disciplines** in our small, all-hands-on-deck team. **Tackled new challenges weekly** while maintaining long-term firmware projects.



Hotfire Test (From company's LinkedIn)

[LinkedIn post](#) about a problem I solved during a hotfire test. I had to overwrite a part of the system during the test because of a mechanical failure.

UBC Rover - Design Team 2021 Fall - Present

Started in my first year at UBC on the electrical and arm team. In my second year on the team, I became Software Lead.

1 SIX AXIS ROBOTIC ARM

What I did:

- Wrote two iterations of the firmware. Current iteration is built with **Zephyr RTOS**, and accepts velocity based commands, with position feedback, at 100 Hz.
- Wrote the higher level software to connect and control the arm. Implemented virtual twin for collision checking and **inverse kinematics**.
- Diagnosed various **electrical and mechanical** problems, and **reviewed** solutions with the mechanical and electrical team.

I'm most proud of:

- The firmware's communication. We no longer experience crashes and can handle much higher rates of control compared to the previous iteration. This enabled us to implement **inverse kinematics**, and apply machine learning algorithms.
- Passing off this code to a new member, and training them so I can focus on other parts of the team.



Our rover in action at [CIRC 2023](#)

2 WATCHDOG "HEARTS"

Watchdogs to start and monitor Linux processes. Before we had to SSH into our rover's on board computers and manually run what we needed.

What I did:

- Utilized the **fork()** system call to start and monitor processes.
- Implemented a **scalable, user-friendly** system fully **configurable through YAML** files to define what subsystems each computer can run.
- A human machine interface to visually show what computers are connected, and what each computer is running. Users can use this, or physical buttons, to run/stop subsystems.



Me setting up the communication base

3 CONTROL BASE (in progress)

I'm also the operator of the rover at competition, and our system is getting more complex where a multi-operator setup is preferred. The control base is a large case, fitted with custom control panels and multiple screens, to allow for up to 3 operators at a time.

What I've done:

- Leading the project, reviewing and planning out the **manufacturing process**.
- CAD** and manufacturing of control panels, using a semi-modular system.
- Higher level HMI software and hardware interfaces, that automatically find and connect to our control panels.



Control Base

And much more software-focused projects with UBC Rover.

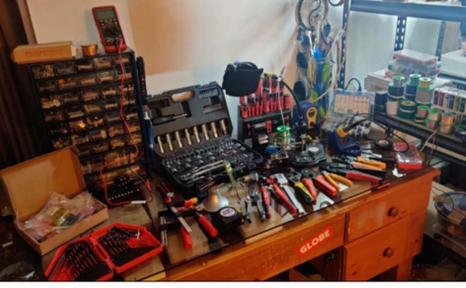
Current Personal Projects

Home Workshop

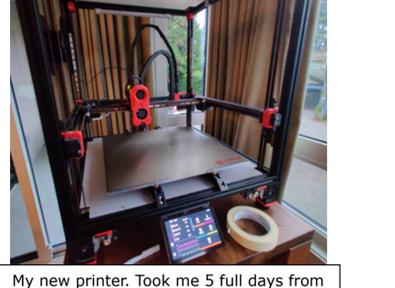
I've **always been a tinkerer/maker**, so having a workspace at home is important to me.

Over the past few months, I've been **investing in myself** by buying tools, components and setting up a workshop at home.

Notably, I've **assembled** a new **3d printer** using a community-designed Voron 2.4 kit. These are notoriously difficult to assemble. I compared each mechanical component to my old printer, and **took time to understand the design choices behind this machine**.



Main desk of my workshop, with my tools laid out.



My new printer. Took me 5 full days from opening the box of parts to first print.

E Bike

Using a Bafang conversion kit, I've converted my mountain bike into a mid-drive electric bike with a custom battery pack. I'm proud of my design choices:

DESIGN CHOICES

- Battery goes in my backpack for better handling and weatherproofing.**
 - Bike is easier to control, as the rider has more control over the center of mass.
 - Easy to waterproof, as I use my backpack's raincover.
 - Active cooling is not needed, as motor won't pull more than 1.5 C of the battery during runtime - during winter, backpack's insulation will be needed.
- LFP cells instead of NIMH or LCO for safety, longevity and ease of maintenance.**
 - NIMH are safest, but least energy dense and I'd have to do full discharge and charge cycles every so often to repair the memory effect.
 - LCO are dangerous due to thermal runaway. They don't have a significant memory effect, but they will likely need replacing after 300-500 charge cycles.
 - LFP cells don't undergo thermal runaway, don't have a significant memory effect, stay effective in colder temperatures and can make it to 1000-2000 charge cycles.
 - LFP energy density is sufficient for my purposes. Being a larger rider, I can get away with a heavier battery.



Battery, with COTS BMS and balancer.



Mid drive motor on my bike. (Specialized Enduro 2011)



Second design, went forward with printing



First design, decided to scrap it early.

The battery case is printed with PLA, (planning TPU, PETG or ABS for next iteration).

Projects from Integrated Engineering Courses

Remote Driving Station

(Group Project)

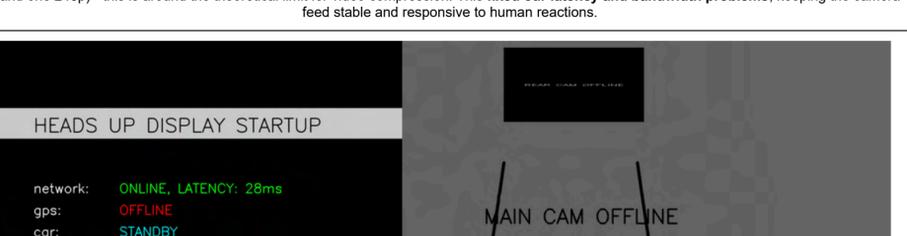
2023-2024 - 8 months

Capstone-like group project, to drive a car over wifi, with latency under the average reaction speed of a human.

[UBC Article about our project](#)

My part was the software and communication.

I'm most proud of our image compression, tuning the parameters of H264, I achieved under 500 kilobits per second for 2 30fps feeds (one 720p and one 240p) - this is around the theoretical limit for video compression. This **fixed our latency and bandwidth problems**, keeping the camera feed stable and responsive to human reactions.



The GUI for the driver. Done with OpenCV draw functions.

'Bobo' the Autonomous BattleBot

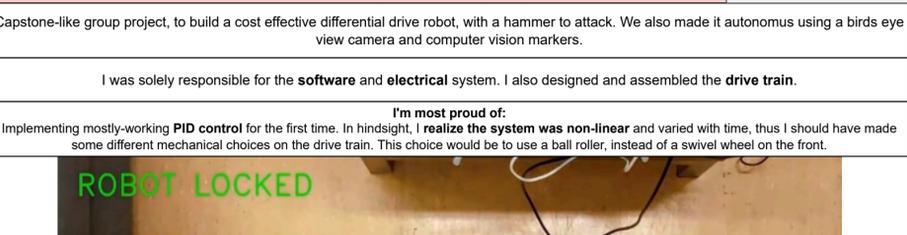
(Group Project)

2023 - 4 months

Capstone-like group project, to build a cost effective differential drive robot, with a hammer to attack. We also made it autonomous using a birds eye view camera and computer vision markers.

I was solely responsible for the **software** and **electrical** system. I also designed and assembled the **drive train**.

I'm most proud of: Implementing mostly-working **PID control** for the first time. In hindsight, I **realize the system was non-linear** and varied with time, thus I should have made some different mechanical choices on the drive train. This choice would be to use a ball roller, instead of a swivel wheel on the front.



The BrrBot - Line following robot

(Individual Project)

2022 - 4 months

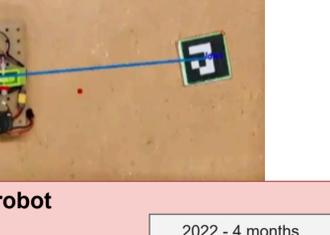
School project where I **deviated significantly from the given components**. The professor gave me a requirement to keep to an Arduino Uno.

[Quick video showing the robot in action](#)

I'm most proud of:

Giving my all into this project and challenging myself. I first tried to make a motorbike-style robot with a gyro, then into a drone style with one wheel, which almost worked. In the end I opted for a wheelbarrow style robot, that turned with drone propellers.

To turn off the robot, I used an IMU, to detect when the robot is picked up and shut down the propellers.



Old Personal Projects

4 Axis Robotic Arm - With facial tracking

[Video showcasing process](#)

Grade 10 10 months

In grade 10, I got in contact with Griffion Pierce, a student in **Engineering Physics at UBC**. With his **mentorship**, I designed and built a robotic arm, with arduino-based firmware and a java-based hardware interface.

I learned common manufacturing methods (waterjet, mill, lathe) and how to follow the engineering process.

My hardware interface also included facial tracking, which used the camera on the end of the arm to find a face, and then send commands to the arm to track the face.



Remote controlled door lock

[Quick video showcasing operation](#)

First year at UBC

A fun project, made with cutlery from the residence dining hall. Hardest part was working around residence rules, so it technically counts as a decoration.

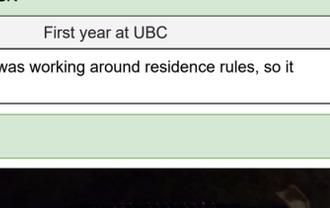
Superwatch

Second year at UBC

Showed me why the arduino 'superloop' architecture is difficult to scale. I stopped the project after implementing reminders, brightness, and a sleep function. I want to retry this project with an RTOS.

The watch connected to the campus wifi, to get the time, and use ChatGPT's api for daily quotes. Quite interesting to **implement an API call directly on an ESP32**.

Also connected to my phone via bluetooth to use it's GPS sensor.



The drone that never flew

Grade 11

Attempted to program the flight controller from scratch. Drone was able to maneuver if suspended from a wire, but was too unstable to fly on it's own.

I attempted to 3d print the propellers with PLA, so this project taught me the importance of safety glasses. Chassis is 3d printed.

[Long video showcasing the drone and another old project](#)



My first robotic arm

Grade 9 10 months

My first proper introduction to robotics. Found a mentor in arduino, but they were only able to meet twice. Needless to say I got hooked, and decided I want to turn this passion into a career.



Thank you for your time.