

Timothy Cai

rcai05@student.ubc.ca | +1 778-512-5896

[portfolio](#) | [linkedin](#)

ABOUT ME

I'm a highly motivated second year engineering student with a particular focus on realistic design and manufacture of hardware, electronics, and software systems. Proficient in project creation and completion. Aiming to obtain a position involving mechanical design in an active and lively environment that directly contributes to project development.

EDUCATION

Bachelor of Engineering - Mechanical

University of British Columbia | 3.73 GPA

Co-op Availability | May - December 2024 (8 months)

Sep 2022 - Apr 2027

Vancouver, BC

SKILLS

Design Skills CAD | Coding | Electronics Design | Product Rendering and Animation | Rapid Prototyping

Technologies Solidworks | FUSION360 | C++ | Python | Arduino | Autodesk EAGLE | Keyshot

Fabrication Lathe | Mill | Waterjet CNC | Shop Tools | Novice CNC

EXPERIENCE

UBC Rocket

May 2021 - Present

Propulsion Lead

Vancouver, BC

- Led the construction, testing, and static fire of a flight capable, 2.5kN kerosene/liquid oxygen rocket engine.
- Characterized engine injectors through use of computational fluid dynamics and real-world testing, optimizing pressure drop and impingement pattern to achieve more efficient geometry
- Operated test stands to confirm test status for engines, from hydrostatic leak checks to high-pressure flows utilizing PLCs.
- Tested and built multiple ignition systems, including a radial solid "R-Candy" igniter and a kerosene-LOX torch igniter.
- Completed a certification for the lathe, mill, and waterjet, as well as obtained experience with MIG and TIG welding.

DI Self-Composites

Aug 2023 - Present

Mechatronics Engineer

Vancouver, BC

- Produced a comprehensive report detailing 7 potential motion system solutions for cold-spray printing.
- Designed, manufactured, and tested a movement system capable of 200mm/s printing speed and 20,000m/s/s acceleration 20% under budget

Powertech Laboratories

May 2023 - Sept 2023

Engineering Technician

Vancouver, BC

- Conducted the installation and upkeep of high pressure hydrogen component test facilities.
- Proposed and oversaw the design and manufacture of an intrinsically safe heating system to increase the heat testing capability of the gas cycle systems.
- Checked data sets for errors and designed visualization templates for the presentation of information to clients.

Team Zephyr Satellite Design Team

Sep 2021 - Jan 2023

Team Captain

Bologna, IT

- Led a team in the production of a CanSat for Canada's first satellite design competition, accomplishing first place at the Canadian CanSat Challenge and finalist at the ESA CanSat Competition.
- Raised 23,000 CAD in funding and produced outreach content for over 100,000 people.
- Delivered four papers on the RotaSat Mission for preliminary, critical design reviews and post-flight reports, receiving the Best Report award from the ESA.

NOTABLE PROJECTS

Level 2 Certification Rocket

Aug 2022 - Present

Personal Project

Vancouver, BC

- Successfully designed, manufactured and flew a rocket to 2.8 kilometers at 1280km/hr (Mach 1).
- Received Level 2 Canadian Association of Rocketry certification.
- Verified requirements were met and flight stability at the system level with FEA, CFD, and OpenRocket.
- Simulated and optimized the topology of internal couplers and structural components, reducing weight by 30% with minimal reduction in strength.

Thrust Vectoring Rocket

Oct 2020 - Sep 2023

Personal Project

Surrey, BC

- Utilized rapid prototyping skills to design a novel mechanical thrust vectoring framework for miniature active control rockets, achieving ± 3.5 degrees of stability in flight.
- Implemented a finite state machine with quaternion orientation and PID control for flight in C++.
- Designed and manufactured custom through-hole and surface-mounted flight and launch computers utilizing EAGLECAD.
- Programmed multiple simulations for control algorithm tuning in JavaScript and Python.

RotaSat Modular Cansat

Oct 2021 - Aug 2022

Hardware Lead

Bologna, IT

- Designed and simulated hardware for modularity and strength, fitting flight computers, cameras, recovery hardware, and active control components into a soft-drink sized form factor.
- Formulated and tested the first CanSat live video stream system, employing a combination of off-the-shelf components and custom electronics.
- Developed and manufactured the first aluminum CanSat reaction control wheel and achieved a desired pointing accuracy of less than ± 2.5 degrees through Zeigler Nichols tuning.

PUBLICATIONS

- **Timothy Cai**, "An Investigation into Active Control for Accessible Orbital Flight," 2023 Canadian Science Fair Journal (CSFJ), *arXiv.org*, Ottawa, Canada.