

Hamzah Faisal

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Education

Toronto Metropolitan University (Formerly Ryerson University)

Sep 2023- May 2028

Bachelor's of Engineering - B.Eng Mechatronics, Robotics and Automation (Mechatronics Engineering)

Relevant coursework: MATLAB, Simulink, Solidworks, C/C++, Python, Control Systems

Experience

Basement Lab

May 2025 - Present

Researcher

Onshape, Fusion 360, KiCAD, ESP32, Python, Embedded Systems, Nanomaterials, Battery Systems R&D

[Portfolio](#)

- Developing **NioniQS**, a solid state sodium ion battery architecture using **Carbon Quantum dot** enhanced cathodes and carbon nanomaterials.
- Synthesized Na_xMnO_2 via **Urea Combustion** for use as a cathode material and tested integration with reduced graphene oxide electrodes.
- Designed and built custom lab equipment including a **centrifuge, hotplate stirrer, PID oven and small materials testing setups**.
- Sourcing materials (Na_xMnO_2 , PEO, NaNO_3), designing experiments, assembling **CR2032 coin cell prototypes**, and collecting performance data.

Autonomous Vehicles Laboratory (AVL) / TMU Velocity

September 2024 - 2025

Researcher

ROS2, C/C++

- Worked collaboratively with **MASc and PhD** students on an autonomous racing competition team (TMU velocity)
- Part of the Electrical and Mechanical team specializing in optimization, aerodynamics and electronics software to hardware integration.

Projects

Rack and Pinion Robotic Gripper

Solidworks, ANSYS Mechanical, Finite Element Analysis (FEA), Embedded Systems

- Designed a rack and pinion robotic gripper mechanism in **SolidWorks**.
- Ran **finite element analysis in ANSYS Mechanical** to study deformation and stress distribution.
- Applied a **100 N actuator load** and compared stresses with PLA material properties used for 3D printed parts
- Calculated a **factor of safety of 1.25** and identified stress concentration at the rack and pinion interface.
- Designed an ESP32 based control system using encoders and FSR sensors to actuate the gripper and achieve controlled motion

Electromechanical Marine Power System

Lithium Iron Phosphate, Power Generation, Reverse Engineering, Electrical

- Built a custom **14.6v 120ah** power system with **6 parallel modular battery packs**, each using a 4s8p cell configuration
- Sourced LiFePO4 **A123 M1B** Nanophosphate Cells salvaged from a **decommissioned Hybrid Bus**.
- Designed full **waterproofing** enclosures to account for **space** constraints, **vibration** and **weather** conditions
- Wired up to a **100A** burst **Battery Management System** with Bluetooth for real time monitoring of each cell group
- Utilized A123 cells for their extreme durability, resistance to thermal runaway, and their rating of **4000+ cycles**
- Capable of supercharging at a **rate of 4C**. Reducing time by **more than 75%** compared to market LiFePO4 packs.

Skills

Programming Languages: Python, MATLAB, C, C++

Skills: CAD Design (SolidWorks, Onshape, Fusion 360), Finite Element Analysis (ANSYS Mechanical), Embedded Systems (ESP32, Raspberry Pi), Prototyping & Fabrication, Materials Testing

Languages: English (Full working proficiency), Urdu (Full working proficiency).