

Hamza Dugmag *Electrical and Computer Engineering Student*

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SKILLS

Electrical: Altium Designer/KiCad, LTspice/Multisim, PLECS, Amateur Radio (Licensed), Soldering, Fusion 360, SolidWorks, 3D Printing
Equipment: Oscilloscope, Vector Network Analyzer, Function Generator, Power Analyzer, Power Supply, Logic Analyzer, Digital Multimeter
Computer: Python, SystemVerilog, VCS/QuartaSim, FPGA, Quartus Prime, MATLAB/Simulink, C/C++, Assembly, Arduino/RPi, Git, Docker

PROFESSIONAL EXPERIENCE

Power Electronics Research Intern, U of T Power Conversion and Systems Analysis Laboratory May 2024 – present
Toronto, ON, Canada

- Developed LTspice simulations of high-speed gate drivers for emerging 1200V eGaN HEMTs to guide the selection of components (diodes, filters, etc.) and parameters (dead time, fsw, etc.).
- Created the PCB schematic, BOM, library components, layer stack, design rules, layout, and routing of a half-bridge containing two GaN devices, bootstrapped level-shift drive circuits, and DC link capacitors using Altium Designer, minimizing trace inductance, Miller plateau, and EMI.
- Assembled (SMT soldering) and validated the board by programming a microcontroller with PLECS and C to gate the switches using SPWM while analyzing waveforms from an oscilloscope.

RTL Design Engineering Intern, Intel Corporation — Programmable Solutions Group May 2023 – Apr 2024
San Jose, CA, United States

- Explored microarchitecture and interconnect (AMBA AXI4) logic design, timing, benchmarking, simulation, and verification of Nios V, the RISC-V based embedded processor IP family for FPGAs.
- Optimized instruction pipelining via register balancing, control-based logic reuse, and FPGA primitive instantiation, improving area utilization by 20%, maximum frequency by 20%, and instructions per cycle by 5%.
- Redesigned the hardware for RISC-V based external debug support and validated it using gdb, OpenOCD, and QuestaSim, improving area utilization by 10% and latency by a factor of 6.
- Defined a custom SystemVerilog style guide to improve code readability, authored numerous functional specifications, and enhanced customer-facing documentation.

Field Robotics Research Intern, UTIAS Autonomous Space Robotics Laboratory May 2022 – Aug 2022
Mississauga, ON, Canada

- Planned, conducted, and documented field tests at various lakes to validate mapping, localization, and stochastic navigation of a retrofitted Clearpath Heron unmanned surface vehicle.
- Generated satellite-informed water masks of Canadian lakes using GISs and created a Python-based simulation platform for evaluating different route-planning algorithms over 2217 graphs.
- Developed a graphical user interface using ROS and ReactJS to track the robot and visualize its navigation policy in real time over a wireless network.
- Y. Huang, H. Dugmag, T.D. Barfoot, F. Shkurti, "Stochastic Planning for ASV Navigation Using Satellite Images", 2023 IEEE International Conference on Robotics and Automation (ICRA). ☑

Engineering Academic Review Mentor, U of T Faculty of Applied Science and Engineering Aug 2021 – Apr 2022
Toronto, ON, Canada

- Hosted drop-in sessions to advise and support first-year Engineering Science students with their academic, professional, and personal development goals as they adjust to university.

Machine Learning Research Intern, U of T Forcolab Group May 2021 – Aug 2021
Toronto, ON, Canada

- Conducted a literature review analyzing the potential of using collaborative Stack Overflow posts to organize knowledge for improved searching and learning experiences.
- Investigated various code clone detection models to compare educational code snippets to programming language documentation.
- Optimized parameters for hierarchical density-based clustering of Stack Overflow posts using Python (NumPy, Pandas, PyPlot) and Docker, increasing precision by 11%.

EDUCATION

B.A.Sc. in Engineering Science (Major in Electrical and Computer Engineering, PEY Co-op), Certificate in Engineering Business, University of Toronto (St. George) Sep 2020 – May 2025
Toronto, ON, Canada

- 3.96/4.00 cGPA, 92% average, 6/6 Dean's Honours List, 11 merit-based awards totaling C\$75000+.
- Courses: Power Electronics, Analog and Digital Electronics, Microwave Circuits, Electric Drives, VLSI Technology, Radio and Microwave Wireless Systems, Control Theory, Capstone Project

PROJECTS

Liquid Rocket Chief Engineer, University of Toronto Aerospace Team — Rocketry Division Jun 2022 – Sep 2023

- Coordinated the design, analysis, fabrication, and testing of a high-altitude liquid-propellant rocket with 19.25 kNs of total impulse.
- Created the design requirements, concept of operations, bills of materials, and mass budget for avionics, propulsion, aerodynamics, airframe, recovery, and GSE subsystems.

- Organized a preliminary design review with advisors and communicated the project to 50+ members at onboarding sessions and team meetings.

Avionics Subsystem Lead, University of Toronto Aerospace Team — Rocketry Division

Jun 2021 – May 2022

- Managed a team to design and integrate radio transceivers, GPS, Li-ion batteries, buck/boost converters, microcontrollers, servo motors, thermocouples, load cells, pressure transducers, and DACs in the flight and ground systems of an award-winning hybrid-propellant rocket. ☑
- Collaborated with propulsion and airframe systems on *SolidWorks* to ensure avionics hardware meets mechanical requirements (sizes, shapes, clearances, layout, ports, harnesses, mounts, etc.).
- Designed surge-protected relay circuits to control DC motors with a *Raspberry Pi* over a wireless network from a custom graphical user interface written in *C++*, increasing power rating by 20x.
- Debugged a strain gauge amplifier board using an oscilloscope (*I2C* trigger), *Arduino*, bench power supply, and digital multimeter.

Electric Guitar Pedals

Dec 2022 – Jan 2023

- Designed a guitar distortion pedal based on a common-emitter NPN Darlington pair.
- Built a guitar tremolo pedal with true bypass switching using a phase shift oscillator.
- Soldered through-hole electronics and packaged the perfboards in custom 3D-printed enclosures created using *Fusion 360*.

Adjustable Power Supply

Jul 2022 – Aug 2022

- Designed, breadboarded, soldered, and tested an adjustable linear power supply based on the LM317 using *KiCad* and a digital multimeter.
- Created a voltage indicator circuit using LEDs, a Schmitt-triggered LM339, and a resistor ladder.
- Incorporated safety features including fuses, Schottky diodes, and inrush current limiters.

AWARDS

(C\$10000) Undergraduate Student Research Award,

Apr 2024

Natural Sciences and Engineering Research Council of Canada

Awarded on the basis of academic merit and research potential.

(C\$4984) Christina and Logan Martin Scholarship in Engineering,

Aug 2023

U of T Faculty of Applied Science and Engineering

Awarded on the basis of academic merit.

(C\$8942) Kenneth Carless Smith Award in Engineering Science,

Aug 2023

U of T Faculty of Applied Science and Engineering

Awarded by the chair on the basis of interest and aptitude in the area of electronics.

(C\$2676) Peter Sands Award in Engineering Science,

Aug 2022

U of T Faculty of Applied Science and Engineering

Awarded by the chair on the basis of academic merit, qualities of character, leadership, and commitment to the engineering profession.

(C\$9000) Undergraduate Student Research Award,

Mar 2022

Natural Sciences and Engineering Research Council of Canada

Awarded on the basis of academic merit and research potential.

(C\$27000) Fessenden-Trott Scholarship, Universities Canada

Sep 2021

Selected among nominees across Ontario universities on the basis of academic merit, leadership, extracurricular involvement, and reference letters.

(C\$5000) Dean's Summer Undergraduate Research Pivot Award,

Sep 2021

U of T Faculty of Applied Science and Engineering

Participated in the *Undergraduate Summer Research Program*.

(C\$2000) May Court Education Award, May Court Club of Oakville

Jun 2020

Awarded on the basis of extracurricular involvement and reference letter.

(C\$2000) Rotary Education Award, Rotary Club of Oakville

Jun 2020

Awarded on the basis of academic merit and community service.

(C\$2000) Faculty of Applied Science and Engineering Award,

May 2020

U of T Faculty of Applied Science and Engineering

Awarded on the basis of academic merit.

(C\$5000) Faculty of Applied Science and Engineering Admission Scholarship,

May 2020

U of T Faculty of Applied Science and Engineering

Awarded on the basis of academic merit and extracurricular involvement.