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/QuestaSim, FPGA, Quartus Prime, MATLAB/Simulink, C/C++, Assembly, Arduino/RPi, Git, Docker*

PROFESSIONAL EXPERIENCE

Power Electronics Research Intern, *U of T Lab for Advanced Power Conversion and Systems Analysis* — 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, *f*sw, etc.).
- Created the PCB schematic, BOM, libraries, stack-up, rules, layout, and routing of a 480VAC half-bridge containing bottom-cooled GaN devices, level-shifted bootstrap driver circuits, and DC link capacitors using *Altium Designer*, mitigating trace inductance, Miller plateau, creepage, and EMI.
- SMT soldered the four-layer board, programmed a DSP via *PLECS* and *C* to send SPWM gating signals and read Hall effect sensor signals, and analyzed oscilloscope and DMM measurements.

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, Thesis

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 over *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 custom-made strain gauge amplifier PCB 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.