

Hamza Dugmag *Graduating Electrical and Computer Engineering Student*

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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 in VFDs to guide the selection of components (diodes, filters) and parameters (dead time, fsw).
- Created the PCB schematic, BOM, libraries, stack-up, DFM rules, layout, and routing of a 700VDC half-bridge containing bottom-cooled GaN devices, level-shifted bootstrap driver circuits, and DC link capacitors using *Altium Designer*, minimizing inductance of commutation and gate loops, Miller plateau, creepage, and EMI.
- Extracted conduction and switching losses to analyze RC snubber performance, evaluate thermal via layouts, and select thermal interface materials and heatsinks to prevent thermal runaway.
- SMT-soldered the four-layer board, programmed a DSP via *PLECS* to send high-resolution SPWM gating signals and read Hall 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 microarchitectural logic design, interfacing (*AXI4*, *JTAG*, *UART*), 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 usage by 20%, fmax by 20%, and instructions per cycle by 5%.
- Redesigned the hardware for *RISC-V*-based external debug support and validated it using *Quartus Prime*, *C*, *QuestaSim*, *OpenOCD*, and *gdb*, 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 Lab

May 2022 – Aug 2022 | Mississauga, ON, Canada

- Planned, conducted, and documented field tests at various lakes to validate SLAM and stochastic navigation of a retrofitted (wiring harnesses and 3D-printed brackets for extra hardware) ASV.
- Created a pipeline in *Python* to extract and filter satellite-informed geometries of lakes, generate water masks and graph instances, and execute and evaluate different route-planning algorithms.
- Designed a GUI 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)*. ☑️

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 information for improved searching and learning experiences.
- Investigated various code clone detection models, including BERT-based language models, to compare educational code snippets to official 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%.

SKILLS

Design: *Altium Designer*, *LTspice*, *PLECS*, *Cadence Virtuoso*, *MATLAB/Simulink*, *Fusion 360*, *SolidWorks*, *Amateur Radio*
Lab: *Oscilloscope*, *VNA*, *Function Generator*, *Power Analyzer*, *Bench Supply*, *Spectrum Analyzer*, *Logic Analyzer*, *DMM*, *SMT/TH Soldering*, *3D Printing*, *Laser Cutting*, *Woodworking*
Embedded: *Python*, *C*, *C++*, *SystemVerilog*, *VCS*, *QuestaSim*, *FPGA*, *DSP*, *Assembly*, *Arduino*, *Raspberry Pi*, *Git*, *Docker*, *ROS*

EDUCATION

B.A.Sc. in Engineering Science (Major in Electrical and Computer Engineering), *University of Toronto (St. George)*

Sep 2020 – May 2025 | Toronto, ON, Canada

- PEY Co-op, Certificate in Electric Vehicle Design, Certificate in Engineering Business.
- 3.96 cGPA, 92% avg., 6/6 Dean's Honours List, 11 merit-based competitive awards, 2021/22 Student Mentor.
- Courses: Power, analog, and digital electronics, control theory, VLSI, electric drives, RF and microwave systems.

PROJECTS

Liquid Rocket Chief Engineer, *U of T Aerospace Team*

Jun 2022 – Sep 2023 | Toronto, ON, Canada

- Coordinated the design, analysis, fabrication, and testing of a high-altitude liquid-propellant rocket with 19.25 kNs of total impulse and a C\$35000 budget.
- Created the design requirements, concept of operations, BOMs, and mass budgets for propulsion, avionics, GSE, aerodynamics, airframe, and recovery subsystems.
- Organized a preliminary design review with advisors and communicated the project to 50+ members at onboarding sessions and team meetings.

Avionics Subsystem Lead, *U of T Aerospace Team*

Jun 2021 – May 2022 | Toronto, ON, Canada

- Managed a team to design and integrate buck/boost converters, radio transceivers, GPS, Li-ion batteries, microcontrollers, servo motors, thermocouples, load cells, pressure sensors, and DACs in the ground and flight systems of an award-winning hybrid 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 *C++* GUI, 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.

Hobby Electronics

- Designed a guitar distortion pedal based on a common-emitter NPN Darlington pair, and a tremolo pedal with true bypass switching using a phase shift oscillator.
- Breadboarded and debugged an adjustable linear power supply using an LM317, *KiCad*, and a DMM, featuring indicator LEDs driven by a Schmitt-triggered LM339.
- Soldered through-hole perfboards and packaged them in custom 3D-printed enclosures created in *Fusion 360*.