Hamza Dugmag *Electrical and Computer Engineer*

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PROFESSIONAL EXPERIENCE

Electronic Design Engineer, *Tesla, Inc.*
Jul 2025 – present | Palo Alto, CA, United States
- Working on the industry's highest production-volume traction inverters that move *Tesla*'s vehicles quickly, efficiently, and reliably.

Power Electronics Research Intern,
U of T Lab for Advanced Power Conversion and Systems Analysis
May 2024 – Aug 2024 | Toronto, ON, Canada
- Developed *LTspice* simulations of high-speed gate drivers for emerging 1.2kV GaN devices in inverters to guide component-level design and system parameter selection.
- Conducted PCBA schematic capture and layout of a 700V half-bridge featuring bottom-cooled GaN switches and level-shifted bootstrap driver circuits using *Altium Designer*, optimizing Miller plateau, creepage, and electromagnetic compatibility.
- Verified IPC-2221 compliance and calculated worst-case conduction and switching losses to evaluate RC snubbers, thermal via patterns, TIMs, and heatsinks to avoid thermal runaway.
- Programmed a *C2000* DSP via *PLECS* to issue high-resolution SPWM gating signals and read Hall sensor mixed signals while analyzing oscilloscope and multimeter measurements.

RTL Design Engineering Intern,
Intel Corporation — Programmable Solutions Group
May 2023 – May 2024 | San Jose, CA, United States
- Explored microarchitectural logic design, interfacing (*AXI4, JTAG, UART*), timing, benchmarking, simulation, and verification of *Nios V*, *Intel*'s *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%, *f*max 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, analyzed trends in *MS Excel*, 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.
- Designed a *Python* pipeline to extract and filter lake geometries from datasets, generate satellite-informed water masks and graph instances, and execute and evaluate route-planning algorithms.
- Developed a GUI using *ROS* and *ReactJS* to track the robot and visualize its navigation policy in real time over a wireless network.

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*, increasing precision by 11%.

SKILLS

Design: *Altium Designer, LTspice, PLECS, Cadence Virtuoso, Spectre, MATLAB, Simulink, Fusion 360, MS Excel*
Lab: *Oscilloscope, Vector Network Analyzer, Power Analyzer, DMM, Signal Generator, Bench Supply, Soldering, 3D Printer*
Embedded: *Python, C/C++, Assembly, SystemVerilog, VCS, FPGAs, C2000 Microcontrollers, Git, Docker*

EDUCATION

B.A.Sc. in Engineering Science, Major in Electrical and Computer Engineering, *University of Toronto (St. George)*
Sep 2020 – Jun 2025 | Toronto, ON, Canada
- High Honours, 3.96/4.00 cGPA, 92% average.
- Certificate in Electric Vehicle Design.
- Certificate in Engineering Business.

PROJECTS

Bidirectional-GaN Current Source Inverters for PCB-Stator Axial-Flux PMSMs, *ESC499 Thesis* ⧉
Sep 2024 – Apr 2025 | Toronto, ON, Canada
- Designed a 340V 10A three-phase current source inverter in *Altium Designer*, featuring cutting-edge monolithic bidirectional GaN switches and space-vector PWM implemented in *PLECS* for a *C2000* DSP.
- Conducted board bring-up and designed and executed validation procedures to drive a three-phase resistor.
- Evaluated the economic and functional feasibility of deploying this topology as a variable speed drive for industrial PCB-stator axial-flux PMSMs.

Electrochemical Impedance Spectroscopy Board for Lithium-Ion Battery Modules, *APS380 Course Project* ⧉
Oct 2024 – Dec 2024 | Toronto, ON, Canada
- Designed an EIS PCBA featuring an integrated GaN half-bridge IC, Hall sensor, ADC, and *Teensy* microcontroller.
- Programmed SPWM gating in *C* and verified functionality via oscilloscope measurements and SPI ADC readings transmitted over COM to a *Python* script.
- Charactrized a 1s5p lithium-ion module by producing a Nyquist plot of the internal impedance that was accurate within an order of magnitude.

Avionics Subsystem Lead, *U of T Aerospace Team*
Jun 2021 – May 2022 | Toronto, ON, Canada
- Managed a team to design and integrate buck and boost converters, radio transceivers, GPS, li-ion batteries, microcontrollers, servo motors, thermocouples, load cells, pressure sensors, and ADCs 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 relay circuits to control DC motors with a *Raspberry Pi* over a wireless network from a custom *C++* GUI, increasing compatible motor power rating by a factor of 20.
- Debugged a custom I2C strain gauge amplifier PCBA using an oscilloscope, *Arduino*, bench supply, and DMM.