

MAHDI HASSEN

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SUMMARY OF QUALIFICATIONS

- Highly motivated 4th year Computer Engineering student driven by a strong desire to learn and apply new technologies.
- Excellent understanding of Computer Engineering concepts such as Computer Architecture, Operating Systems, and Digital Circuits through key courses and personal projects, most notably demonstrated by developing a CHIP-8 interpreter and RISC-V CPU.
- Strong knowledge of Electrical Engineering concepts such as Analog Circuits, Control Systems, Signal Processing, and PCB design through key courses and club involvement, notably by designing the electrical subsystem of a satellite and a combat robot.
- **Research Interests:** AR/VR Hardware and low-level software, ASICs & FPGAs, Reconfigurable Computing and its applications, Embedded System and SoC Architectures, Parallel & Low-Latency Processing

EDUCATION

Bachelor of Engineering, Computer Engineering

Exp. Apr 2025

Toronto Metropolitan University, GPA: 3.5

- **Key Courses:** Embedded System Design, Computer Vision, Digital Systems Engineering, Signals & Systems, Control Systems, Microprocessor Systems, Computer Architecture, Operating Systems, Advanced Algorithms

SKILLS

Programming Languages: Assembly, C, C++, Python, Java, GDScript

Hardware Design: VHDL & Verilog with Quartus II & Xilinx Vivado

PROJECTS

Mega Meow-Mart: Management-Simulation Game | Godot, GDScript (Python)

August 2024

- Developed an arcade-style management simulation game in 4 days for a game jam given the theme “built to scale.”
- Used the Godot game engine to develop the game, focused on the overall software architecture and feature implementation.
- Successfully finished on time, placing in the top 10% among over 7600 submissions.

Goat boy: Game Boy Emulator Core | C, Python

Feb 2024 – May 2024

- Developed a Game Boy Emulator core in C with SDL2, applying computer architecture concepts such as memory management, stack operations, registers, and interrupt handling to ensure instruction-accurate software emulation of CISC-style SM83 core.
- Created a Python script to automate the writing of CPU’s 500+ opcodes, eliminating the need to manually write 5500+ lines of code.

RISC-V CPU | VHDL, Quartus II

Jan 2024 – April 2024

- Designed and developed a pipelined, 32-bit RISC-V CPU based on the Harvard Architecture using Quartus II and VHDL.
- Applied key computer architecture concepts to design fundamental CPU components such as the data path, control unit, reset circuit, memory modules, registers, and ALU; tested each component to ensure expected outputs were achieved.
- Successfully programmed and executed custom software on CPU with 26 different memory addressing & data processing instructions.

CHIP-8 Interpreter | C, SDL2

June 2023 – Sept 2023

- Developed a CHIP-8 interpreter using C with SDL2 to run and play classic CHIP-8 programs on a 64x32 monochromatic display.
- Implemented the fetch-execute cycle for all 35 CHIP-8 instructions, ensuring that each instruction is processed accurately.
- Achieved compatibility with over 20 popular CHIP-8 games, demonstrating comprehensive emulation of the CHIP-8 instruction set.

Digital Circuit Simulator | Java

Dec 2022 – May 2023

- Applied digital circuit and object-oriented programming concepts in Java to develop a digital circuit simulator, showcasing knowledge of popular object-oriented design patterns, as well as transistor and logic gate level circuits.
- Successfully enabled users to define asynchronous digital circuits with up to 8 inputs, allowing them to save and interconnect distinct circuits to generate truth table outputs for various combinations of stored designs.

8-Bit General Purpose Processor | VHDL, Quartus II

Dec 2022

- Developed custom 8-bit processor with an ALU that takes 9 custom opcodes, registers, and FSMs to display output on seven segment display using Cyclone-model FPGA board.
- Utilized VHDL to program and connect individual components, showcasing a strong understanding of digital logic and design.

Arduino-Based Drone | C, C++

June 2022 – Aug 2022

- Collaborated as a team of 3 students to develop a drone using an Arduino Nano in C, oversaw software development by programming electrical components with various communication protocols to produce a functioning drone with a PID control system.
- Created 2 prototypes; communicated with group members to document changes with each iteration.

EXTRACURRICULAR EXPERIENCE

Team Captain and Founder | TMU Battle Bots

Aug 2023 – present

- Founded TMU's Battle Bots design team with intent of leading the team to compete in the National Havoc Robotics League (NHRL) in October 2024, overseeing the comprehensive design of a 30lb combat robot.
- Actively developing a simulation program in the Unity game engine for rapid algorithm design and autonomous control testing.
- Designed the electrical subsystem of the combat robot, conducted research on motors, batteries, controllers, and related components.
- Assembled electrical system of robot; interfaced Arduino with RF receiver to control high power motors with ESCs and 6S batteries.
- Successfully recruited 30+ students from varying disciplines to form a diverse and competitive team of skilled engineering students.

Conference Selection Committee | Metropolitan Undergraduate Engineering Society

June 2024 – present

- Collaborating with other selection team members to decide criteria used to judge delegate applicants for various engineering conferences, including PEO-SC at the University of Waterloo.
- Conducted 15+ interviews and read through 40+ applications for different engineering conferences to maximize benefit for both the delegate and the general engineering student body.

Electrical Lead | TMU Can-Satellite Team

Sept 2022 – June 2023

- Collaborated with a team of 10 students to design and build a can-sized satellite; competed in CANSAT competition at Virginia Tech.
- Designed and built sensor subsystem based on contest criteria, routed PCB on Altium designer, taking each component's specific requirements into consideration, attained full points on the electrical subsystem design review.
- Developed and lead a KiCAD workshop, focusing on the development of an ATMEGA328 based Arduino clone PCB.

First Year Ambassador | First Year Engineering Office

Sept 2021 – May 2023

- Lead pre-orientation events for over 900 first-year engineering students to ease transition into university.
- Presented social media campaigns to increase engagement amongst 2,700+ followers.
- Mentored 5 first-year students and provided advice related to time management, organization, and extracurriculars.

Guidance, Navigation & Control Member | Metropolitan Hyperloop

Dec 2022 – May 2023

- Worked with 50+ team members to develop a functioning high-speed pod for the hyperloop competition.
- Developed MATLAB GUI that displays real-time data and sends live controls to the pod with an Arduino.

Website Lead | Metropolitan Undergraduate Engineering Society

Dec 2021 – May 2022

- Developed and maintained MUES website using WordPress, lead a team of 3 students to implement new features and pages.

WORK EXPERIENCE

Custom PC Builder | Self-Employed

April 2023 – present

- Designed and built 20+ custom computers for a wide range of clients, showcasing strong understanding of current PC technologies.
- Consulted with clients to determine hardware and performance requirements, researched optimal components for specific use-cases.
- Provided post-build technical and troubleshooting support when needed.

Research & Engagement Assistant | Toronto Metropolitan University

May 2023 – April 2024

- Researched methods to engage first-year students, increasing average event attendance by 15%.
- Wrote detailed reports outlining strategies to increase student engagement, showcasing strong professional communication abilities.
- Developed a university prep course to help 400 incoming students prepare for first year engineering, increasing viewer retention by 160%, achieved over \$17 500 in net ticket sales, exceeding projected profits by 200%.

Private Tutor | Self-Employed

Sept 2017 – April 2024

- Tutored students in a wide variety of subjects, ranging from 9th grade math to university-level Calculus and Electric Circuits.