

# MAHDI HASSEN

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## SUMMARY OF QUALIFICATIONS

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- Highly motivated 4<sup>th</sup> 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, Digital Circuits, through key courses and personal projects, most notably demonstrated by developing a Game Boy emulator and Chip-8 interpreter.
- 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.
- **Technical Skills:** Signal processing & Control systems modelling in MATLAB & Python, Circuit simulation in Multisim, VHDL in Quartus II, PCB design in KiCAD and Altium; Programming Languages: Assembly, C, C++, Python, Java

## EDUCATION

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### Bachelor of Engineering, Computer Engineering

Exp. Apr 2025

Toronto Metropolitan University, Minor in Philosophy, GPA: 3.5

- **Key Courses:** Digital Circuits, Object Oriented Software Design, Data Structures & Algorithms, Circuit Analysis, Electronic Circuits, Signals & Systems, Control Systems, Microprocessor Systems, Computer Architecture, Operating Systems, Advanced Algorithms

## PERSONAL PROJECTS

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### Goatboy: Game Boy Emulator | C, Python, SDL2

Feb 2024 – present

- Developing a Game Boy Emulator 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 core.
- Created a Python script to automate the writing of CPU's 500+ opcodes, eliminating the need to manually write 5500+ lines of code.
- Utilizing SDL2 to accurately emulate the Game Boy's 160x144 display and decode its proprietary audio data format.

### RISC-V CPU | VHDL, Quartus II

Jan 2024 – April 2024

- Designed and developed a 3-stage, 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 are 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 monochrome 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.

## EXTRACURRICULAR EXPERIENCE

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### Team Captain and Founder | TMU BattleBots

Aug 2023 – present

- Founded TMU's BattleBots design team with intent of leading the team to compete in the National Havoc Robotics League (NHRL) in 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.
- Assembling 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.

### 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.

## WORK EXPERIENCE

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### 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.

### 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%.

