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 though key courses and club involvement, notably by designing the electrical subsystem of a satellite and a combat robot.
- Strong knowledge in embedded systems concepts such as real-time operating systems (RTOS), interrupt handling, peripheral interfacing (SPI, I2C), memory management, and low-level hardware-software integration

EDUCATION

Bachelor of Engineering, Computer Engineering **Exp. Apr 2025**

Toronto Metropolitan University, GPA: 3.5

- **Key Courses:** System on Chip Design, Embedded System Design, Real Time Control Systems, Computer Vision, Data Engineering, Signals & Systems, Microprocessor Systems, Computer Architecture, Operating Systems, Advanced Algorithms, Computer Networks

SKILLS

Programming Languages: Assembly, C, C++, Python, Java, GDScript, JavaScript, TypeScript, React, Next.JS, Tailwind CSS
Technologies: AWS, MySQL Databases, SQL Alchemy, Keil uVision, Fireship
Hardware Design: VHDL & SystemVerilog with Quartus II & Xilinx Vivado, Verification, PCB Design in Altium and KiCAD,

PROJECTS

M3 Paint: Embedded Drawing Application | C, Kiel uVision **Nov 2024 – Dec 2024**

- Developed a paint application for the NPX LPC1768 Cortex-M3 microcontroller using C in the Keil uVision IDE, featuring 3 drawing modes (pixel, line, circle) and an interactive keypad-controlled menu.
- Designed custom data storage scheme and space-optimized LCD displayer driver, reducing memory usage for custom drawing storage by 87.5%, showcasing a strong understanding of memory management and efficient programing on resource-constrained hardware

VGA Pong: FPGA-based Pong Game | VHDL, Xilinx ISE **November 2024**

- Designed and implemented classic Pong game using VHDL on a Xilinx Spartan-3E FPGA, rendered on a VGA monitor.
- Programmed paddle input and ball movement with collision detection to build a complete gameplay experience.

Cache Memory Controller | VHDL, Xilinx ISE **October 2024**

- Designed and implemented a Cache Controller using VHDL within the Xilinx ISE CAD environment. Interfaced custom logic controllers with SRAM memory and an SDRAM controller, ensuring proper read/write operations and cache block replacement.
- Performed hardware emulation on Xilinx Spartan-3E FPGA, testing key performance parameters including hit/miss determination, data access time, block replacement time, and cache miss penalties

Mega Meow-Mart: Management-Simulation Game | Godot, GDScript **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 8% 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.

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 2025 overseeing the comprehensive design of five 1-3lb and one 30lb combat robot.
- Led 10+ projects, not limited to the design of six robots, a test box, club website and the simulation software.
- Actively developing a simulation program in the Unity game engine for rapid algorithm design and autonomous control testing.
- Designed the electrical subsystem of the 30lb combat robot, conducted research on motors, batteries, and other related components.
- Assembled electrical system of robot; interfaced Arduino with RF receiver to control high power motors with ESCs and 6S batteries.
- Recruited 40+ students from varying disciplines to form a diverse and competitive team of skilled engineering students.
- Successfully competed in the Bot Brawl competition in November 2024, debuting our universities first ever combat robots.

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

Founder | Anomaily **Sept 2024 – present**

- Founded Anomaily, a platform addressing social media addiction and lack of focus by curating and delivering personalized, user-intended content through scheduled email digests, set to launch in March.
- Designed and deployed a scalable backend using Firebase for real-time database management, authentication, and API integration, integrated with a Next.js front end hosted on Vercel for optimal performance.
- Built a content aggregation system incorporating RSS feeds and social media APIs, enabling users to customize delivery of content from popular sources.
- Conducted market research and user interviews, identifying key demographic pain points, driving strategic refinements to the MVP.

Career Development Coordinator | Toronto Metropolitan University **Sept 2024 – present**

- Reviewed and provided feedback on resumes for engineering students, tailoring it to align with their specific industry's standards.
- Designed and led workshops on strategies for showcasing personal projects to demonstrate technical skills in personal portfolio.

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 2023**

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