

Omar Farag

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Education

- University of Toronto** **Toronto, ON**
B.Eng. Computer Engineering *September 2019 – April 2023 (expected)*

Relevant Courses: Computer Organization (80%), Software Design & Communication (91%), Operating Systems (in prog.), Algorithms & Data Structures (in prog.)

Experience

 **Medical Computer Vision & Robotics** **Mississauga, ON**
Research Assistant *July 2021 – Present*

- Used C# to implement a physics simulation using the material point method that will allow for surgeons to simulate the cutting of flesh during surgical operations.
- Implemented a laser that cuts through flesh in real time by implementing De Casteljau's algorithm to create bezier curves for the laser to follow.
- Used the burst compiler and jobs system in Unity to improve frame rendering from 20 fps to 300 fps.

 **UofT Aerospace Team** **Toronto, ON**
Software Developer & Researcher *June 2021 – Present*

- Researched and worked on a compression algorithm that uses neural networks in Python to predict voxel values in a hyper-spectral cube.
- Encoded the weights and biases of the neural network into a bit-stream to be sent down to the ground station
- Implemented the SHA256 hashing algorithm to secure communications between the ground station and the HERON MK II CubeSat.

Side Projects

 **3D Software Renderer**

- Used C++ to build a software renderer entirely pipelined in the CPU that renders meshes to the Windows Console. Did not use any graphics APIs, this was built from the ground up using linear algebra.
- Used a variation of the Painter's Algorithm to render distant objects in the scene before parts that are nearer.
- Used back face culling and clipping out of view triangles to speed up the renderer by 500%.

 **ComeNGo GIS**

- Developed a GIS tailored towards commuters using C++ and Open Street Maps API.
- Sped up processing of large amounts of geographical data by 2500% by improving the data processing pipeline by using dynamic programming and multi-threading.
- Implemented a variation of Dijkstra's algorithm to instantly find routes between 2 or more locations.
- Developed a greedy algorithm that finds an adequate solution to a variation of the travelling salesman problem.

 **MoodLights**

- Developed and built a winning project for Canada's Largest Makeathon, MakeUofT (Smartest Hack).
- Created a smart lamp using individually addressable LEDs, an arduino and a raspberry pi.
- Used adafruitio and IFTTT to control the lamp based on the local weather, voice commands, etc.

Skills

Languages: C, C++, C#, Python, HTML/CSS, ARM Assembly

Software: Linux/Unix, Confluence, Visual Studio, Unity 3D, Git, Blender 3D, Netbeans