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 (91%), Operating Systems (in prog.), Algorithms & Data Structures (in prog.)

Skills

Languages: C, C++, C#, Python, ARM Assembly, Verilog, HTML/CSS
Software: Linux/Unix, Confluence, Visual Studio, Unity 3D, Git, Blender 3D, Netbeans

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 and implemented 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 **Python**, **C++**, individually addressable LEDs, an arduino and a rasberry pi.
- Used adafruitio and IFTTT to control the lamp based on the local weather, voice commands, etc.

A comprehensive list of most of my side projects can be found @ **omarfarag.ca/#Portfolio**