

PROFILE

I am a C++ software engineer based in London. My interests and experience are focused on computer graphics, particularly high performance 3D engine development and its application in game engines and scientific visualisation. In my current role I work on 3D graphics and results post-processing for a leading computational fluid dynamics (CFD) simulation package, using C++17 and OpenGL with Qt. I have gained 4.5 years of commercial C++ experience since graduating with a B.A. in Computer Science from St. Catherine's College, University of Oxford.

EDUCATION

- **University of Oxford** Oxford, UK
Bachelor of Arts in Computer Science; 2:1 Oct. 2014 – Jul. 2017
- **Royal Latin School** Buckingham, UK
A-Levels: Mathematics (A), Further Mathematics (A*), Physics (A), and AS Biology (A)* Sep. 2012 – Jun. 2014

WORK EXPERIENCE

- **Future Facilities** London, UK
Senior Product Developer, C++/Qt/OpenGL Feb. 2021 – present
Product Developer, C++/Qt/OpenGL Oct. 2017 – Feb. 2021
 - I spearheaded the creation and development of a new 3D graphics engine - called Enhanced View - which significantly overhauled the existing UI of the product. After three years in development, Enhanced View now ships as the default 3D view in the current release.
 - In 2018, I proposed the project and demonstrated a successful prototype of the new Enhanced View. Since then, I have worked on it full time, mentoring and line managing additional developers who were later assigned to the project. I designed the OpenGL graphics engine from scratch using modern principles, resulting in a dramatic improvement in graphical quality and rendering speed. I implemented both forward and deferred pipelines, with support for dynamic lights with real time shadows. We also extended the feature set with new functionality such as smooth real-time playback of transient result data, by storing the data directly on the GPU to be read by shaders. The software can now display extremely large models with thousands of components at real-time framerates.
 - Enhanced View now features prominently in marketing materials. ([link](#))
 - I'm involved in strategic planning for the long-term direction of the product, estimating the feasibility of new features and allocating work to developers. As part of this, I am involved in recruitment decisions and have served as an interviewer on several occasions.
 - As a senior developer, I line manage two developers, one of whom works exclusively on Enhanced View. My responsibilities include reviewing their code and advising them regarding particularly challenging technical problems.
 - I planned and delivered a short course teaching C++ to non-programming staff in the company and received very positive feedback.

PROJECTS

I love to work on personal projects in my free time because it's a great way to explore ideas from other technical niches.

SIDE PROJECTS:

- **Game Engine:** As a long-term side project, I have been developing my own game engine from the ground up. I find this to be an extremely useful way to learn graphics techniques and high performance software design patterns. I have implemented forward and deferred rendering, physically based rendering, skinned animation, particle systems, shadowmapping, entity component system, immediate mode UI, and marching cubes on the GPU.
- **Chess Engine:** Over Christmas 2020 I created a chess engine which uses minimax and alpha-beta pruning to automatically play moves in a chess game.
- **Compiler:** I have recently started making a toy compiler to learn how they work. It compiles a simple C-like language into x86_64 binaries using yasm.

UNIVERSITY PROJECTS:

- **Final dissertation:** "Procedurally generating planetary objects: Exploring the feasibility of isosurface extraction approaches" explores the real-time procedural generation of asteroids and planets. I designed and implemented a system which is capable of drawing and shading arbitrarily large meshes which represent the isosurfaces of completely generalisable scalar fields, dynamically adapting detail on parts of the mesh. I wrote the engine from scratch in C++ and OpenGL, utilising GPU

hardware acceleration to achieve real-time performance. I solved the difficult problem of stitching together meshes produced by the Dual Contouring algorithm. I successfully applied for a grant from my college for a high-end GPU for the project and received a first class grade.

- **University team project:** I was part of a team of six who designed and implemented a system for predicting stock market prices by harvesting data from users playing a mobile app game. I wrote Go code for the server side which broadcasted financial data out to mobile app clients, and aggregated their actions within a game world to make a prediction about whether a stock price would rise or fall. My team won a monetary prize which was awarded to the best three teams after a presentation day to the rest of the students and representatives from the industry.
- **Essay on isosurface extraction:** As part of my work towards my dissertation, I wrote an essay comparing “Marching Cubes” and “Dual Contouring”, for which I received a prize from the college.

PREVIOUS PROJECTS:

- ***Ticket to Ride AI*:** As an independent side project during the Christmas break of 2016, I created a framework in Java to find optimal parameters for “AI” agents playing the board game *Ticket to Ride*.
- **“Avatar” *Minecraft* mod:** Prior to university, my biggest project was a 50,000 SLOC Java game modification adding content to *Minecraft*. I collaborated with a friend for the programming, and several artists around the world created game assets for the project. The mod was downloaded more than 200,000 times and received countless positive reviews.

SKILLS

I am experienced with:

- C++, Modern OpenGL, Qt
- Linux, macOS, Windows

At university, I took a wide variety of courses including:

- Machine Learning
- Computer Security
- Compilers + Language principles
- Concurrent Programming
- Functional Programming
- CUDA GPGPU Programming (summer course)

REFERENCES

References are available upon request.