

Thomas Chernaik

Computer science undergraduate
(BSc, Meng)

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Summary

Fourth year Computer Science student at the University of Leeds, specializing in high-performance graphics and games engineering, with a focus on real-time rendering systems and high-performance C/C++ programming. Developed a deferred & forward PBR rendering system using Vulkan, as well as geometric mesh repair/simplification tools. Engineered a GPU-native Gaussian splatting rasteriser from scratch, utilizing compute shaders and parallel sorting to render 2M+ splats interactively on integrated hardware. Passionate about advancing real-time graphics and solving problems to create new, prettier, high-performance solutions.

Projects

Vulkan Renderer (C++, GLSL) / University Coursework

DECEMBER 2024 - JANUARY 2025

- Implemented a Vulkan renderer from scratch in C++ with real-time performance and a PBR shading model.
- Added normal mapping to enhance surface detail, using a custom compression technique to reduce memory usage by over 75% with no visible quality loss.
- Implemented shadow mapping with PCF filtering and resource pooling to support multiple shadow-casting lights.
- Built a deferred shading pipeline to improve lighting efficiency and reduce overshading.
- Created tools to visualise overdraw, overshading, and mesh density for debugging and optimisation.
- Added bloom as a post-processing effect using a multi-pass Gaussian blur system.
- Runs at >60fps, across various devices including modern GPUs and integrated graphics.

Geometric Mesh Processing Toolkit (C++) / University Coursework

NOVEMBER 2024 - DECEMBER 2024

- Automated mesh repair by detecting holes, walking the boundary using directed edges, and placing new vertices at centroids to close gaps.
- Simplified meshes with a greedy algorithm, removing vertices with low Gaussian curvature while maintaining manifold properties.
- Built a tool to test for manifoldness, identifying non-manifold edges or vertices and calculating genus using the Euler formula.
- Wrote utilities to convert triangle soup files into face index format and compute directed edges for downstream processing.
- Developed standalone command-line utilities capable of processing large geometric datasets efficiently.

OpenGL Gaussian Splatting Rasteriser (C++, GLSL) / Third Year Project

DECEMBER 2023 - MAY 2024

- Implemented a fully GPU based pipeline for rendering splats, resulting in a renderer that can render scenes of up to 100,000 splats in real time on integrated graphics, and two million+ interactively.
- Wrote a GPU-Radix sort that can sort one million 32-bit key/value pairs in 80ms on integrated graphics, scaling linearly for sorting more values.
- Optimised the renderer using tile-based rendering, resulting in a 5x improvement in FPS
- Implemented a CPU based renderer to fully test, debug, and compare outputs of the GPU renderer to ensure the quality of the renders.
- Achieved a first-class grade on the project, which included a 30 page technical report.

OpenGL Rocket Game (C++, GLSL) / University Coursework

NOVEMBER 2023 - DECEMBER 2023

- Implemented a rocket launch scene with OpenGL and C++, and GLSL shaders
- Wrote GLSL shaders to render the world, rocket, and launchpads
- Developed a particle system for the rocket boost, able to render two million particles in real time (4ms), on integrated graphics
- Managed loading OBJs and drawing their vertices every frame with different materials
- Added a split-screen system using two camera perspectives to view the rocket
- Implemented a modular UI system to display text to the screen and add buttons with functionality to launch and reset the rocket
- Implemented a simple animation system for the rocket's flight

Scribbles web game (Python) / Hobby project

JUNE 2023 - AUGUST 2023

- Solo project showcasing web development skills
- Created multiplayer system which could serve one or more user created games containing three or more users each on one server
- Provided a synchronised gameplay experience to players using websockets
- Deployed to cloud services using a Docker container
- Developed a responsive and mobile first frontend user interface utilising Bootstrap and Javascript

Chess desktop app (C++) / Hobby project

JULY 2023 - AUGUST 2023

- Developed a standalone chess application using C++ and SDL2 library
- Implemented core chess logic, including legal moves and check conditions
- Applied knowledge learned in university such as OOP and dynamic memory management

Unity Delivery Game (C#) / Ludum Dare (Game Jam)

MAY 2023

- Partnered with a friend to rapidly develop a 3D game using Unity and C#
- Designed and implemented core gameplay mechanics, including package collection and delivery
- Engineered a custom physics system for van collisions with buildings and world borders

Various Unity projects (C#, HLSL) / Hobby projects

SEPTEMBER 2021 - PRESENT

- Completed 5+ hobby projects exploring Unity
- Developed a FABRIK implementation for procedural character animation with C#
- Crafted a slime mould simulation using HLSL compute shaders for real time simulation of hundreds of thousands of agents
- Designed procedural grass using batching and shaders and used optimisation methods to allow rendering of millions of blades of grass in real time, with wind and object interaction animations
- Implemented a peer-to-peer multiplayer system utilising UDP to provide real time updates between two game clients

Education

University of Leeds/ Computer science with High Performance Graphics and Games Engineering (BSc, MEng)

SEPTEMBER 2021 - JUNE 2025

- First-Class BSc, on track for First-Class MEng
- Relevant modules: Computer Graphics (undergraduate), Foundations of Computer Graphics, Advanced Rendering, Modelling and animation, Data structures and Algorithms
- Languages studied: C, C++, Java, Python

Dame Alice Owen's school / A-levels

SEPTEMBER 2019 - JUNE 2021

- Computer science **A***
- Mathematics **A***
- Physics **A***
- Further Maths **A**

Ashmole Academy / GCSEs

SEPTEMBER 2014 - JUNE 2019

10 GCSEs at grades 9-6 (including Mathematics and English)