***Peter*/Zheyuan HU** *University of Cambridge | Jardine Scholar | Research Assistant | Challenge Solver*
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Looking forward to research around Visual Computing (Graphics / Vision).

TECHNICAL SKILLS

Data Sci: Prob and Stat, Python, NumPy, ML&DL, PyTorch, Computer Vision.
Visual: Computer Graphics, OpenGL, GLSL, XR (AR/VR/MR), Unity, Unreal Engine, 3D Modelling (Blender).
Prog: C/C++, Java, OOP, CMake, gdb, Algorithms and Data Structure, OCaml (Functional Programming).
Dev Tools: bash/shell, git, CI/CD pipeline, Docker, VS Code, Pycharm, IntelliJ IDEA.

EDUCATION

University of Cambridge, United Kingdom *Oct 2025-Jun 2026*
M.Eng. (Hons) Computer Science. Jardine Scholarship
Selected from top undergrads, on par with the **M.Phil** in research depth and assessment rigor, stated by the department.
Graphics and Image Processing, Network architectures, ML and the Physical World, Architecture, Mobile Health, etc.

University of Cambridge, United Kingdom *Oct 2022-Jul 2025*
B.A. (Hons) Computer Science | First-Class (72.4) | Dissertation (93.5). Jardine Scholarship
OS, DB, Architecture, Graphics, XR, Network, BioInfo, Quantum Computing, Information Theory, etc | detailed notes.

Universitas Amoiensis, Project 985 & Top 1 in Southern China *Sep 2021-Jun 2022*
B.Eng. undergrad in Software Engineering | Rank 1/173 (1st term) | Yearly (88.2) | Transcript. Withdrew after 1st year
C and C++, Object-Oriented Programming, Calculus and Linear Algebra, University Physics, Presentation, ACM, SSE.

LIST OF PUBLICATIONS

Under the supervision of *italic*, † indicates equal contribution.

@ Cambridge Open Reality and Visual AI Lab, directed by Prof. Cengiz Öztireli. *May 2024-Present*

FreNBRDF: A Frequency-Rectified Neural Material Representation arXiv * * * *2024-2025*
Zheyuan Hu†, *Chenliang Zhou*†, Cengiz Öztireli.
IEEE MLSP'25 (International Workshop on Machine Learning for Signal Processing).
- Computer Graphics (BRDF, real-world materials), Frequency Rectification (Spherical Harmonics).
- Evolved from my individual project in the Machine Visual Perception module (rank 2/15).

NeuMaDiff: Neural Material Synthesis via Hyperdiffusion arXiv * * *2024-2025*
Chenliang Zhou, **Zheyuan Hu**, *Alejandro Sztrajman*, Yancheng Cai, Yaru Liu, Cengiz Öztireli.
NeurIPS'25 UniReps (International Workshop on Unifying Representations in Neural Models).
- Computer Graphics (BRDF, real-world materials), Vision (generation via PCA, VAE, diffusion).
- Adapted from my undergrad dissertation project (93.5, rank 1/133).

CHOrD: Generation of Collision-Free, House Scale, and Organized Digital Twins for 3D Indoor Scenes with Controllable Floor Plans and Optimal Layouts *In review* * arXiv * *2025*
Chong Su†, Yingbin Fu†, **Zheyuan Hu**, *Jing Yang*, Cengiz Öztireli, *Fangcheng Zhong*, et al.
- Indoor Scene Synthesis, Generative Models, Digital Twin Generation. Mentored by Dr Fangcheng Zhong.

RESEARCH OUTPUTS

Hair modelling, rendering and simulation, **Zheyuan Hu**. survey * *2024*
Scheduling, DVFS, idle management, **Zheyuan Hu**. review * *2023*

INDUSTRY RESEARCH

Long-term Rotational Internship @ Industry Research Center, Cambridge Science Park, UK.
Research Engineer: **Graphics Algorithm/GPU Architecture** *Jun 2023-Jan 2024*
- Linear Algebra, Convolution (Bilateral Filter Kernel on Monte Carlo Samples using GBuffer), spatial-temporal locality.
- NN (PyTorch): Train (lr decay, shuffle data 5GB+, dropout) and Infer (conservative loss), 3D Data Encoding, etc.
- Graphics: Key developer for Ray Tracing simulation (OpenGL, GLSL, OpenMP, CMake). Host sharing sessions.
- Performance Engineer / Data structure design, targeting micro-benchmarks (performance counters, cache hit rate, etc.)
- Supervised by PhD graduate, senior AI researcher and senior GPU Architects.

Research Intern: **CPU/Operating System Architecture** *Jun-Oct 2023*
- Energy-efficient CPU Scheduling, DVFS policy, Idle Management review. Convex Optimisation, Duality, LP, Pareto Optimality, Stanford CVX, Online Algorithms, Competitive Analysis, Disjoint Set Union-find, etc.
- Set up simulation, event-driven architecture with state machine, taking in runtime profiled task model. Compare different algorithms w.r.t complexity, performance, energy (temperature, thermal), Memory Contention, floor-plan, applications. Python (Numpy, Matplotlib, Networkx, Pandas, DAG, TopologicalSorter, etc).

Software Engineer: **GPU Driver** *Dec 2022-May 2023*
- GPU industry workflow, Linux, Vulkan; GPU driver and verification, Game Engines (UE4), shader debug (RenderDoc).
- Introducing independent full automation tools in the CI/CD, reducing error rate to nearly 0.

HONORS & AWARDS

Highest Scoring Undergrad Dissertation, Computer Lab., University of Cambridge *Cert.* * *Aug 2025*
ranked first out of 133 candidates, following dual marking and a viva examination with two more professors.

Cambridge Summer Internship and Research Award, the Browning fund *Cert.* * *Jun-Oct 2025*
supporting my research at Cambridge Open Reality and Visual AI lab.

College Scholarship & Prize for Computer Science, Magdalene College Governing Body *Cert.* * *Aug 2025*
in recognition of the excellent performance in the Computer Science Part II.

Gold Medal, 3D Data Compression Algorithm, national Tech Arena '22, UK * * *10 Oct-26 Nov 2022*
engineering + research, digesting papers and source code, like RFC1951, etc.

- Responsible for implementation & improvement of LZSS. 6-level / concurrent LZSS Compression.
- C with bitwise operators & hash tables, optimization via branch prediction and concurrency.
- In a team of 4, leading the team and engaging in pre-processing, serialization with teammates.

Top 2 Team, Maritime Data Science, Mercuria Hackathon '22, Switzerland * * *16 Dec-18 Dec 2022*
regression for Route-Planning and reduce the carbon emissions of the maritime industry.

Jardine Scholarship, the Jardine Foundation *Cert.* * *Oct 2022-Jun 2026*
merit-based, fully-funded Scholarship while pursuing my four-year studies at the University of Cambridge.

Third Place, High school Science and Technology Innovation Contest '20, Shanghai *Cert.* * *Apr 2020*
deep research thesis into the phenomenon of tire-locking, including pros and cons using Force Analysis.

- Self-made physical simulation test. Introduce Anti-lock braking system into our research with help from mentor.

Accepted for Publication twice, Shanghai Students' Post '18 & '19, Shanghai *Oct 2018, May 2019*
topic: Effective Ways to Overcome Obstacle in Study, Campus Life without Snack Stores.

Participant, Chinese Physics/Mathematical Olympiad (ChPO, CMO) *Oct 2019*

LIST OF PROJECTS

Machine Learning and its applications *Oct 2022-Jan 2024*

- **DNN in CV** *Stanford CS231n* kNN, Softmax, SVM, MLP, CNN. Caption: RNN, Attention. Gen: GAN, VAE. |
- **ML** *Stanford CS229* Linear classifiers (Logistic Regression, GDA), SGD, Regularization, PCA, SVM.
- Kaggle DataSci practice & ML model (Regression, MLP, etc), PyTorch DNN Debugging, Visualization, Validation.
- Text Classification via Naive Bayes, HMM, NLP; Social Network and Graph. |

Graphics Renderer (C++, OpenGL) * * *Jul-Sep 2022*
real-time simulation, composite design pattern for 3D objects class hierarchy with transformation.

- MIT6.837 ray casting, normal visualization, rendering, voxel rendering, super sampling.
- large OOP project, with 3D objects, light, camera classes, building over 20 C++ source files from scratch.

System

Operating System (MIT 6.S081) * *Oct-Dec 2022*
user-mode and kernel programming of Unix V6 RISC-V multiprocessor.

- implement Unix utilities, System Call. Process Scheduling, Memory (Segment, Page, VM), I/O, File.

Database Design Management System (CMU15-445 Project) * * *Aug-Oct 2022*
engineering and code style: using C++ STL, Google C++ Style Guide.

- Memory Management, including Buffer Pool Management System, Replacement policy: LRU.
- Concurrency: implement the Parallel Buffer Pool Manager.

C, C++, OOP

Multifunctional Supermarket Management System (C++) * * *Apr 2022*
inheritance polymorphism, operator overloading, read/write files, etc.

Typing Game (C, EasyX) * * *Dec 2021*
a standard keyboard layout, where different modes are provided.

Front/Back-end

Weather App (Flutter) * *April-May 2023*
collaborating with team members on an App integrating weather forest with daily calendar events. I am responsible for:

- Frontend: Beautiful design with UI components, written in Flutter, with Object-oriented programming.
- Backend: Integration of iCalendar API, asynchronous IO, Computer Networking: HTTP request, get.

Personal Website and Blog (HTML, CSS, React) * *Aug 2022-Present*
project blogs, files, etc; built up from scratch using HTML/ CSS. Deployed by React, with high code reuse.

Game Dev

Interactive AR block tower (AR foundation, Unity) * * *Demo* * *Jan-Mar 2025*
Extended Reality (XR) module video-based AR project.

Priest-Beneath (Unity, C#) * * *WebGL* * *Feb 2023*
2023 Cambridge Game Jam (Group Project).

Utility Tools

URL Finder (Web Crawler, Python, Go) ⋆ *Apr 2023*

download the web page available at the input URL and extract the URLs of other distinct pages linked to from the HTML.

- Data Structure: Lists, Sets; Computer Networking: HTTP request, like get; Synchronous File IO.

Trace File Parser (Java) ⋆ *May 2023*

parsing trace files and generate a unique and sorted list in Java.

INVITED TALKS

Speeding up real-time Ray Tracing, Churchill College Tech talk '23, University of Cambridge *Slides* ⋆ *Nov 2023*

Sharing of my industry research topic on Intersection, Acceleration, also presented at internal R&D group.

3D graphics asset compression, national Tech Arena '22, UK *Slides* ⋆ *Nov 2022*

Sharing of my exploration on 3D obj. compression, with novel 6-level algorithmic improvements.

From Jardine Scholar to Journey-Maker, Shuping Foundation *Slides* ⋆ *Aug 2025*

Sharing of my journey as a Jardine Scholar at the University of Cambridge for prospective applicants.

Personal Portfolio *Slides* ⋆ *Present*

REVIEWING EXPERIENCE

Peer Reviewer in the UniReps Workshop, 39th Conference on Neural Information Processing Systems (NeurIPS'25).

EXTRACURRICULAR INTEREST

Photography, Music, Gym | *Society*: Ethics in Science | *Econ*: Macro & Micro, Money Banking | Volunteering

APPENDIX: REFERENCE

"Zheyuan Hu, together with AI team researcher, proposed the ray-prediction algorithm. According to the test results, the ray intersection latency in reflection scenarios can be reduced by 33%, RTU energy consumption can be reduced by 15%, or RTU throughput can be improved by 20%. The results achieved are recognized by the hardware team. This algorithm will be the official delivery technology of the X project. They have demonstrated strong algorithmic capabilities and have shown typical examples of cross-team collaboration. Well done and congratulations!" Source: Research Center

"This project is exceptional in scope, depth, and originality. It shows independent research capability, deep technical implementation, and significant scientific contribution. This work is well beyond the undergraduate standard, and is comparable to a strong MSc or even early-stage PhD project." Source: Dissertation supervisor report (Chenliang Zhou)

"During our time working together, I found Peter to be a highly collaborative and supportive colleague who consistently demonstrated a willingness to share his knowledge and expertise with others. Peter's ability to problem-solve complex C/C++ development issues was invaluable, and his commitment to learning and staying up-to-date with the latest advancements in his field is truly impressive. His passion for ray-tracing is contagious, and I have learned so much from his knowledge sharing." Source: LinkedIn