

# ZIMU GUAN

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## EDUCATION

<b>University of California San Diego</b> · San Diego, CA <i>Master of Science in Computer Science</i>	Sept. 2022 – Mar. 2024 GPA: 4.00/4.00
<b>University of Illinois at Urbana-Champaign</b> · Urbana, IL <i>Bachelor of Science in Computer Engineering · with High Honors · <b>Minor in Mathematics</b></i>	Aug. 2018 – May. 2022 GPA: 3.91/4.00
<b>Zhejiang University</b> · Hangzhou, China <i>Bachelor of Engineering in Electronics and Computer Engineering</i>	Aug. 2018 – Jun. 2022 GPA: 3.93/4.00

## SKILLS

**Programming Languages:** C/C++, Python, Rust, x86-asm, Haskell, SystemVerilog, Javascript/HTML/CSS, Shell  
**Tools:** CUDA, FFmpeg, NumPy, CMake, Git, Docker,  $\LaTeX$   
**Computer Graphics:** Vulkan, OpenGL, Physically based rendering, Ray tracing, Volumetric rendering, NeRF

## WORK EXPERIENCE

**Qualcomm Inc** · Graphics Engineering Intern – Qualcomm Graphics Research June 2023 – Sept. 2023  
*C++, Vulkan, Ray Tracing, NeRF, Neural Rendering, GPU* San Diego, CA

- Developed and optimized **MobileNeRF** rendering using Vulkan raytracing API, achieved **31% average FPS improvement** on mobile devices compared to the original rasterization implementation.
- Participated in the development of MobileNeRF's rasterization rendering, which is currently under review for contribution to the **official Vulkan Samples by the Khronos Group**.
- Conducted deployment, testing, and performance profiling on mobile devices, identifying and addressing bottlenecks.
- Implemented various JSON-configurable rendering features, such as deferred/forward rendering, instancing, and bindless descriptors support.

**Xinhua Zhiyun** · Software Engineer Intern – Audio/Video Processing Infrastructure Jul. 2022 – Sept. 2022  
*C/C++, FFmpeg, OpenGL, skia, Audio/Video Processing* Hangzhou, China

- Maintained an audio/video synthesis & processing engine utilizing FFmpeg, OpenGL, and Skia, providing technical support for video production services with over **10,000 daily requests**.
- Improved FFmpeg source code to address video transcoding challenges in distributed systems, successfully resolving the duration-increasing problem. **Outperformed Alibaba's cloud transcoding service**, achieving error-free results.

**State Key Lab of CAD&CG @ Zhejiang University** · Research Intern · [\[Link\]](#) Apr. 2021 – Aug. 2021  
*C++, Geometry Processing, Computer Graphics, Advisor: Prof. Jin Huang* Hangzhou, China

- Created a conformal all-hex mesh refinement pipeline with flexible density control to enhance physically-based animation.
- Reduced density errors by an average of **31.1% compared to traditional methods** by transferring the selective padding approach for mesh optimization to the refinement process.
- Designed and implemented a suite of geometry processing tools, including mesh evaluation, element-by-element refinement, and visualization, seamlessly integrated into the refinement pipeline.

## SELECTED PROJECTS

**CUDA-accelerated Photorealistic Path Tracing Renderer** · [\[Link\]](#) Jan. 2023 - Present  
*C++ 17, CUDA, Physically Based Rendering, Path Tracing, Parallel Computing*

- Developed a photorealistic path tracing renderer with a robust feature set, including Multiple Importance Sampling, BVH acceleration, textures, environment map, **Mitsuba** scene format, and support for a wide range of material models (Disney Principled BSDF, Blinn-Phong, etc.), enabling the creation of highly realistic 3D scenes.
- Achieved advanced rendering capabilities such as heterogeneous volumetric path tracing and ReSTIR DI, integrated CUDA/multi-threading acceleration for rapid rendering, enhancing productivity in complex 3D scenes.
- Leveraged modern C++, such as `std::variant`-based polymorphism, to optimize code structure and enhance maintainability.

**FPGA-Based Real-time 3D Graphics Pipeline** · [\[Link\]](#) Dec. 2020  
*SystemVerilog, Graphics Pipeline, Parallel Architecture, Hardware System Design*

- Designed and implemented a basic real-time graphics pipeline on FPGA, enabling the rendering of 3D objects through Model View Projection transformation, viewport triangle clipping, and rasterization.
- Optimized FPGA hardware resource utilization, including SRAM, DRAM, and NIOS core, to achieve a **consistent 60FPS real-time rendering performance**, with the frame buffer and parallel hardware design.

**TLEOS - Linux-like Operating System** · [\[Link\]](#) Apr. 2021 - May. 2021  
*C, x86-asm, Qemu, Operating System Design*

- Developed a Linux-like operating system kernel **from scratch**, encompassing essential Linux kernel functionalities including scheduling, interrupts, system calls, exceptions, virtual memory, and a read-only file system.
- Implemented support for various devices including keyboard, mouse, sound card, serial port, RTC, PIT, network card and VGA.