

Cheng Cao

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Education

UC Berkeley / EECS / 5th Year Masters of Science

Aug 2021 ~ Now. Berkeley, CA

UC Berkeley / L&S Computer Science / Bachelor of Arts

Aug 2018 ~ May 2021. Berkeley, CA

Technical Classes Taken:

Undergraduate Technical GPA: **3.95/4.00** Undergraduate Overall GPA: **3.77/4.0**

Computer Graphics / User Interface / Data Structures & Algorithms / Computer Architecture / Discrete Mathematics and Probability Theory / Computational Color / Operating Systems / Deep Neural Networks / Digital Integrated Circuits & FPGA / SoC Tape-out

Experience

NVIDIA / Raytracing Engineer (Intern)

Summer 2021

Developing the rendering system for Nvidia Omniverse, focusing on its lighting algorithms for both real-time application and offline visualization, achieving real-time unbiased lighting on complex scenes with hundreds to thousands of lights.

UC Berkeley / EE290C "Tape-out" Class

Spring 2021

Taping out a RISC-V SoC with onboard Bluetooth radio under TSMC 28nm HPC. Contributing to the design of the compute complex & simulation / validation system. Designing the physical layout of digital top level & fixing LVS/DRC violations.

Blizzard Entertainment / Graphics Engineer (Intern)

Summer 2020

Experimenting & prototyping hardware accelerated ray-tracing (DXR) for Blizzard's in-house game engine. Exploring fully path-traced rendering of game scenes, achieving real-time GI on large scale scenes (Scene sizes over 60km).

UC Berkeley / Teaching Assistant for Computer Graphics & Imaging

Spring 2020, Summer 2020, Spring 2021

Developing and delivering course materials, guiding open-ended student projects, inspiring future graphics engineers

UC Berkeley Vive AR/VR Lab / Researcher

Mar 2019 ~ Nov 2020

Helping the research on the topic of "Indoor scene mesh reconstruction" for indoor AR/VR applications using SDFs.

Projects

Taichi — A programming language designed for high-performance graphics

<https://github.com/taichi-dev/taichi>

- Developing Vulkan backend, reducing CPU overhead, achieving 2x performance compared to CUDA in some tests.
- Improving JIT compilers' code generation (loop-invariant code motion), optimizing GPU runtime library.

Wisdom-Shaders — An advanced custom shaders-mod for Minecraft

<https://gh.bc3.moe/Wisdom-Shaders>

- Implementing physically based shading, volumetric lighting, path-traced GI, AO, and other post-processing effects.
- Utilizing compute shaders, offer high frame rate experience (120FPS+), while maintaining 30FPS @ 720p on an iGPU.
- Gaining 3 million+ downloads, achieving the Most-Popular Award @ Netease Minecraft Developer Conference 2020.

Voxel Cone Tracing for Real-time Global Illumination — A real-time GI renderer

<https://bc3.moe/VCTGI>

- Utilizing voxelized GI & ground-truth ambient occlusion to achieve real-time realistic global illumination lighting.
- Developing Pipelang, a shader meta-programming DSL based on Lua, achieving cross-compiling & permutations.
- Supporting both Vulkan and DirectX with a custom-built RHI.

Deep Learning Based Demosaicing — A ML based image sensor demosaicing method

<https://bc3.moe/hdrdmcnn>

- Utilizing residual training and combining pervious work on image demosaicing and image segmentation networks.
- Supporting complex color filter array design, achieving high signal to noise ratio on non-conventional CFAs.

ASM76 — An interpreted bytecode VM

<https://github.com/IcebergThings/ASM76>

- Running a custom instruction set on an interpreted bytecode VM (capable of 300+MIPS on modern CPUs).

Skills

Graphics & Compute APIs (Vulkan / DX12 / DXR), GPU Programming (GLSL / HLSL / CUDA), C, C++, CMake, RTL Design and Verification (Verilog / Chisel), Micro-architecture, RISC-V, SPIR-V, Machine Learning, Git, Javascript, Ruby, Python, JAVA