Gaoxiang Zhao

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Education

University of Pennsylvania August 2025 – May 2027
MS in Scientific Computing Philadelphia, USA

- Related Courses: Machine Learning, Learning in Robotics, Physical Intelligence

Wuhan University September 2021 – July 2025
BEng in Communication Engineering Wuhan, China

Experience

University of Pennsylvania December 2025 – Present
Research Intern (Advisor: Kostas Daniilidis) Philadelphia, USA

- Working on event-based computer vision and its applications in robotics.

ZJU-Coohom Joint Lab of CG&AI August 2024 – November 2024
Research Intern Hangzhou, China

- Explored cutting-edge algorithms in high performance GPU Monte-Carlo ray tracing.

Projects

Monte-Carlo Rendering Engine December 2023 – January 2025

- Developed a high-performance simulation engine in C++ to solve high-dimensional light transport equations via Monte-Carlo integration.
- Utilized variance reduction techniques including Importance Sampling and Multiple Importance Sampling (MIS) to optimize convergence rates.
- Implemented advanced algorithms including Path Tracing, Bidirectional Path Tracing (BDPT), and Stochastic Progressive Photon Mapping (SPPM) for complex global illumination.
- Optimized performance via multi-threaded ray tracing, BVH acceleration structures, and arena-based memory allocation for large-scale rendering.

Diffraction Simulation June 2024 – August 2024

- Implemented wave-optical rendering framework for physical light transport simulation beyond geometric optics.
- Derived closed-form edge-based Fraunhofer diffraction formulation, enabling free-space diffraction in path tracing without phase-carrying rays.
- Conducted convergence analysis comparing discretized RGB and continuous spectral wavelength models.

Sampling in Real-time Rendering September 2023 – November 2023

- Constructed image pyramids to visualize aliasing artifacts across different resolutions, validating sampling theories via frequency domain analysis.
- Investigated the impact of downsampling on texture details and structural preservation, linking spatial domain artifacts to spectral signal loss.

Technical Skills

- Programming: C++, Python, CUDA, MATLAB
- Tools: LaTeX, Linux, Git, PyTorch, Unity, OpenGL, Vulkan, Issac, ROS
- Language: English (Proficient), Mandarin (Native)