Tony Yiding Tian

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Education

University of Pennsylvania - School of Engineering and Applied Sciences Philadelphia, PA
Computer Engineering, B.S.E. *May 2027*

- GPA: 3.74 — Relevant Courses: GPU Programming, Operating Systems Design & Implementation, Data Structure & Algorithm, Advanced Rendering, Interactive Computer Graphics, Computer Animation, Embedded Systems

Projects

CUDA Path Tracer | *CUDA, C++* Sep 2025 - Oct 2025

- Monte Carlo path tracer capable of rendering complex 3D scenes with custom 3D models and environment maps
- Implemented shading BSDF kernel supporting global illumination, multiple importance sampling, anti-aliasing, sub-surface scattering, capable of rendering various PBR material types with albedo and texture maps
- Integrated third-party libraries of tinyGLTF to support glTF 2.0 mesh loading and Nvidia OptiX for denoising
- Utilized various techniques to boost performance: material sorting (+5%), Russian Roulette (+6% - 24%), stream compaction (+24% - 67%), and Bounding Volume Hierachy (3× - 160× framerate in complex scenes)
- Project Repo and Demo: github.com/tonytgrt/CUDA-Path-Tracer. A previous standalone performance focused stream compaction project with detailed analysis in Nsight: github.com/tonytgrt/Project2-Stream-Compaction

PennOS - UNIX-like Operating System | *C, Shell, Kernel* Mar 2025 – May 2025

- Architected and implemented a complete user-level operating system in C with team of 4, featuring 8000+ lines of systems code with full process lifecycle management
- Designed Process Control Block (PCB) data structure managing 50+ concurrent processes with metadata including PID allocation, priority levels, parent-child relationships, signal handling, and user/kernel stack management
- Implemented preemptive multi-level priority scheduler supporting 3 priority levels with Round Robin time-slicing (10ms quantum), preventing starvation through priority aging and achieving 95% CPU utilization
- Built POSIX-compliant interactive shell supporting 15+ built-in commands (ps, kill, jobs, fg/bg), I/O redirection, pipeline chaining, and batch script execution with robust error handling

WebGPU Renderer | *WebGPU, TypeScript, WGSL* Sep 2025 – Oct 2025

- Implemented three advanced rendering techniques for real-time lighting of 5000+ dynamic point lights: Naive Forward, Forward+, and Clustered Deferred rendering using WebGPU compute and graphics pipelines
- Engineered screen-space light clustering system using compute shaders, subdividing view frustum into 16×9×24 grid with exponential depth slicing and sphere-AABB intersection testing for efficient light culling
- Achieved 53x performance improvement over naive rendering (497ms to 9.3ms at 5000 lights) and 3.5x speedup vs Forward+ through overdraw elimination and optimized memory access patterns
- Live demo deployed at webgpu.tonyxtian.com, rendering Sponza scene with real-time performance metrics and interactive controls. GitHub repo: github.com/tonytgrt/Project4-WebGPU-Forward-Plus-and-Clustered-Deferred

Experience

Linux Kernel Policies Research Assistant - PURM Scholar May 2025 – Aug 2025
Learning Directed Operating System (LDOS), Prof. Sebastian Angel *Philadelphia, PA*

- Developed eBPF-based kernel monitoring infrastructure collecting real-time TCP networking metrics retrieved from 5 crucial kernel tcp functions of tcp_v4_rcv, v4_connect, state_process, congestion_control, and cubic
- Engineered high-performance data analysis pipeline processing 10,000+ TCP state transitions per second, identifying critical performance bottlenecks in kernel networking policies and congestion control algorithms
- Architected and contributed 2000+ lines of C and Python code to open-source KernMLOps repo, implementing kernel probing infrastructure used by 15+ researchers. GitHub Repo: github.com/tonytgrt/KernMLOps

Beta Test Engineer & QA Analyst Dec 2022 – Oct 2023
miHoYo - Genshin Impact (AAA Mobile Gaming) *Remote*

- Selected as exclusive beta tester for Genshin Impact, a $4B+ revenue mobile game with 60M+ monthly active users, participating in pre-release testing cycles every 6 weeks
- Conducted comprehensive quality assurance testing for 10+ character releases, each generating $1M+ in revenue, ensuring gameplay balance and identifying critical performance issues before public launch
- Performed systematic testing of open-world gameplay mechanics including combat systems, puzzle design, and performance optimization across multiple mobile platforms (iOS, Windows)

Technical Skills

Programming: CUDA, C/C++, WGSL, GLSL, Parallel algorithms, Memory management, Rendering pipeline
Graphics/Rendering: NSight Profiling, Path Tracing, Deferred Rendering, Rasterization, Animation systems, PBR
Tools/APIs: Nvidia NSight, WebGPU, Vulkan, Visual Studio, Qt, OpenGL, WebGPU, Git, CMake, Clang, GDB