Sean Siddens

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Research Interests

Parallel Programming, Specialized Hardware Accelerators, Compilers, Hardware Security, Computer Graphics

Education

University of Washington   September 2024 — Present
PhD: Computer Science   GPA: 4.0/4.0
University of California, Santa Cruz   September 2020 — August 2023
Bachelor of Science: Computer Science   GPA: 3.97/4.0

Research Experience

Trail of Bits
Intern   December 2023 — January 2024

- Investigating GPU security vulnerabilities of multi-tenant GPU systems

University of California, Santa Cruz
Research Assistant   April 2023 — September 2024

- Conducted research into novel hardware side-channels on CPUs and GPUs
- Designed and implemented cross-platform benchmarks for evaluating performance of fine-grain synchronization and dynamic work allocation on GPUs
- Analyzed and presented benchmark results leading to the identification of novel performance models on a wide variety of GPU models
- Significantly contributed to a Vulkan compute library, implementing GPU latency measuring capabilities and optimizing GPU resource usage

Projects

Current (C++)

- High-level general-purpose parallel programming framework targeting Tenstorrent AI accelerators

Epiphron (C++, Vulkan, OpenCL)

- Developed a microbenchmark suite targeting the performance of fine-grained synchronization and dynamic work allocation on GPUs.
- Authored benchmark kernels in OpenCL; framework and compute library written in C++ using the Vulkan API.
- Implemented kernel launch, barrier, and graph application

Rendering Engine (C++, Vulkan)

- Built a 3D rendering engine leveraging the Vulkan graphics API.
- Implemented OBJ model loading, asset management, arcball, and FPS camera systems.
- Developed PBR and Blinn-Phong material systems, and integrated point, directional, and cubemap lighting.

Multithreaded HTTP Server (C, Bash)

- Designed a thread-pool server architecture to handle multiple client requests concurrently over sockets.
- Utilized worker threads for fetching tasks from a work queue, secured by mutexes for thread safety.
- Ensured server-side coherency and atomization with multiple-reader single-writer semantics using file locks.
- Created bash scripts for integration testing and server functionality validation.

Professional Experience

University of California, Santa Cruz
Junior Specialist   December 2023 — August 2024

- Contributing to the Ecoscape project, a tool to visualize and model the habitat connectivity of birds in order to help inform conservation and climate efforts
- Responsible for the design and implementation of the front end web app and backend system for computing and serving modeled habitat tiles.

SELECTED COURSES

Graduate Courses

- Computer Systems Architecture
- High-Performance Computer Architecture

Bachelor's Courses

- Parallel and Concurrent Programming
- Fundamentals of Compiler Design
- Computer Architecture
- Analysis of Algorithms
- Database Systems

SKILLS

- **Programming:** C, C++, OpenCL, CUDA, WGSL, GLSL, Python, Javascript, Rust, Bash, Haskell, HTML/CSS
- **Tools/Frameworks:** Unix, Git, Vulkan, WebGPU, OpenGL, Make, CMake, PostgreSQL

Teaching Experiences

CSE 351: The Hardware/Software Interface, *Teaching Assistant*   Fall 2024

References

Prof. Mark Oskin
Professor, University of Washington
E-mail: oskin@cs.washington.edu
Scholar Profiles: Personal Page — Google Scholar

Prof. Tyler Sorensen
Assistant Professor, University of California, Santa Cruz
E-mail: tysorens@ucsc.edu
Scholar Profiles: Personal Page — Google Scholar