

YUFEI SHI

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Research Interests

Computer Architecture – Spatial & Reconfigurable Computing, Memory Consistency Models
Computer Systems – Parallel Computing, Concurrency, Operating Systems

Education

Carnegie Mellon University **Pittsburgh, PA**
B.S. in Electrical and Computer Engineering Expected May 2024

Research Experience

Carnegie Mellon University, ABSTRACT Research Group **Pittsburgh, PA**
Research Assistant Jan 2023 – Present

- **Research on the memory consistency model of tag-less pipelined dataflow architectures:**

Problem: Current tag-less pipelined dataflow architectures (e.g., Pipestitch) rely on programmer-enforced non-aliasing memory accesses to ensure memory consistency. When the non-aliasing assumption is violated (which happens), the architecture may exhibit violations of sequential consistency.

Goal: Enforce sequential consistency at low cost with no memory fences using microarchitectural support.

Approach: Enforce load-store ordering by delaying memory operations in the shorter dependency chain.

- **Research on asynchronous parallel programming for spatial dataflow architectures:**

Problem: Excessive operation reordering and synchronization is required for applications with irregular memory access patterns to run on resource-constrained CGRAs.

Goal: Developing a new programming model to enable asynchronous parallel programming for spatial dataflow architectures.

Approach: Explicitly express parallelism amenable to dataflow execution and the underlying CGRA architecture.

Publications

Ripple: Asynchronous Parallel Programming for Spatial Dataflow Architectures **ASPLOS 2025**
..... *Summer cycle submission-to-be*
Souradip Ghosh, **Yufei Shi**, Nathan Beckmann, Brandon Lucia

Presentations

MCD: Mesh Collision Detection with Parallel Acceleration **May 2023**
Carnegie Mellon University, Pittsburgh, PA

Teaching Experience

18-344 Computer Systems and the Hardware-Software Interface Teaching Assistant, CMU, **Fall 2023**

18-213/613 Introduction to Computer Systems Teaching Assistant, CMU, **Summer 2023**

18-213/613 Introduction to Computer Systems Teaching Assistant, CMU, **Fall 2022**

18-213/613 Introduction to Computer Systems Teaching Assistant, CMU, **Summer 2022**
18-213/613 Introduction to Computer Systems Teaching Assistant, CMU, **Spring 2022**

Selected Courses

15-410 Operating System Design and Implementation **CMU, Fall 2023**
Designed and implemented an Unix-like x86 OS kernel that supports multiple virtual memory address spaces via paging, preemptive multitasking, and a small set of important system calls as well as device drivers.

18-447 Introduction to Computer Architecture **CMU, Spring 2023**
Designed and implemented an RV32I processor featuring a 2-way superscalar in-order 5-stage pipeline. Optimized design for both IPC and IPC-per-Watt and achieved a ranking in the first quartile among the class-wide competition.

15-418 Parallel Computer Architecture and Programming **CMU, Spring 2023**
Developed an application to accurately determine the minimum distances between convex meshes for robotic arm motion planning by leveraging both CUDA and OpenMP acceleration.

18-344 Computer Systems and the Hardware-Software Interface **CMU, Fall 2022**
Implemented a memory hierarchy simulator supporting two levels of cache, each fully configurable. Used the simulator to conduct design space exploration to find the Pareto optimal design for a set of workloads.

18-330 Introduction to Computer Security **CMU, Fall 2022**
Crafted x86 binary application attacks, cryptographic attacks and web attacks.

Skills

Programming Languages: C, C++, Python, Rust, Shell, x86 Assembly

Hardware Design Tools: SystemVerilog, Synopsys VCS, Synopsys Design Compiler, Intel Quartus, gem5

Developer Tools: GDB, Git, Vim, VS Code, Valgrind, Make, Regex, Anaconda, Various Linux Distros, Pin Tool

Technologies: MATLAB, SOLIDWORKS, NumPy, Matplotlib, OpenMP, MPI, CUDA, OpenGL, HTML, \LaTeX

Leadership / Activities

Plaid Parliament of Pwning (CTF Team), Carnegie Mellon University **Sep 2022 – Present**
General Member

cmuTV, Carnegie Mellon University **Sep 2021 – Present**
General Member, Buggy 2022 Cameraman

Chinese Students and Scholars Association, Carnegie Mellon University **Sep 2021 – Present**
General Member, Director of Design during 2022