

# 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**  
M.S. in Electrical and Computer Engineering ..... Expected May 2025

**Carnegie Mellon University** ..... **Pittsburgh, PA**  
B.S. in Electrical and Computer Engineering with University Honors, CQPA: 3.69 ..... 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

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- 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

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- 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, L<sup>A</sup>T<sub>E</sub>X

## Leadership / Activities

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- 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