Shuangyu Cai

Yao Class, Institute for Interdisciplinary Information Sciences (IIIS), Tsinghua University

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EDUCATION

- **Tsinghua University** [Sep'21-Present]
  Yao Class, IIIS, advised by Prof. Mingyu Gao.

  Core Courses

Introduction to Computer Systems	Operating Systems and Distributed Systems
Database Systems	Computer Architecture
Introduction to AI Chip: From Verilog to FPGA	Theory of Computation
Quantum Communication and Cryptography	Quantum Computer Science
Fundamentals of Cryptography	Game Theory
Machine learning	Introduction to Computer Networks
Introduction to Computer Science	Algorithm Design
Advanced Computer Graphics	Probability and Statistics
Calculus	Linear Algebra

EXPERIENCES

- **University of California, Davis** [Feb'24-Aug'24]
  Research Intern, advised by Prof. Junshan Zhang.
  Direction: AI, World Model, Autonomous Driving

RESEARCH INTERESTS

- My research interests lie in both computer systems and AI, including efficient memory architectures like processing-in-memory (PIM), scalable and high performance data processing, and world models on reinforcement learning. In addition, I expect to explore the intersection of the two fields, such as more efficient computation architectures for large model, or AI techniques applied on system design.

PUBLICATIONS

- **PimPam: Efficient Graph Pattern Matching on Real Processing-in-Memory Hardware**
  Shuangyu Cai, Boyu Tian, Huanchen Zhang, and Mingyu Gao
  Proceedings of the ACM on Management of Data (SIGMOD), Jun, 2024.

- **NDPBridge: Enabling Cross-Bank Coordination in Near-DRAM-Bank Processing Architectures**
  Boyu Tian, Yiwei Li, Li Jiang, Shuangyu Cai, and Mingyu Gao
  In 51st International Symposium on Computer Architecture (ISCA), Jun, 2024.

- **Seesaw: Compensating for Nonlinear Reduction with Linear Computations for Private Inference**
  Fabing Li, Yuanhao Zhai, Shuangyu Cai, and Mingyu Gao
  In 41st International Conference on Machine Learning (ICML), Jul, 2024.

- **CarDreamer: Open-Source Learning Platform for World Model based Autonomous Driving**
  Dechen Gao, Shuangyu Cai, Hanchu Zhou, Hang Wang, Iman Soltani, and Junshan Zhang
  arXiv preprint arXiv:2405.09111, May, 2024.

AWARDS

- 36th Chinese Physics Olympiad (CPHO), First Prize (National) [Oct'19]
- Mathematical Competition of Senior High School of China, First Prize (Shanghai) [Dec'19]
- National Olympiad in Informatics in Provinces, First Prize (Shanghai) [Dec'20]
- China Undergraduate Mathematical Contest in Modelling (CUMCM), First Prize (Beijing) [Nov'22]
- Outstanding academic scholarship, First Prize [22]

SKILLS

- **Programming Languages**: C, C++, Python, Java, Scala, Verilog, Chisel, MATLAB.

- **Tools & Libraries**: PyTorch, Matplotlib, Jax, LaTeX.
- Writing a five-stage RISC-V CPU in both HDL and simulators like Ripes.
- Designing an AI chip on FPGA capable of running CNN.
- Extensive knowledge in computer architecture, AI, quantum computer science, database, cryptography, game theory.