YUHONG SONG

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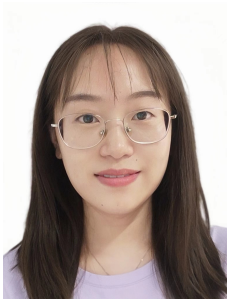
East China Normal University · Ph.D.

George Mason University · Postdoc



Brief Introduction

I obtained my Ph.D. degree in June 2024 from the School of Computer Science and Technology at East China Normal University, under the supervision of Prof. Edwin Hsing-Mean Sha (National Thousand Talents Scholar, Changjiang Scholar, NSFC Distinguished Young Scholar). From March to August 2024, I worked as a Research Assistant to Prof. Zili Shao at The Chinese University of Hong Kong. Since September 2024, I have been a Postdoctoral Research Fellow at George Mason University, supervised by Prof. Weiwen Jiang. So far, I have published 20 academic papers in international conferences and journals. Among them, 7 papers were published as the first author, including 4 papers in CCF-A/SCI Q1/CCF-T1, 2 papers in CCF-B, and 1 paper in CCF-C level. Additionally, I have 2 Chinese patents that have been disclosed.

Research Interests: AI Systems, Hardware-Software Co-design, Quantum Computing, Quantum Neural Network.
(1) Hardware-Software Co-design for AI Systems: To tackle the limited storage and energy challenges on customizable edge devices for AI model applications, my research explores the automated hardware-software co-design solutions based on AI model compression and stochastic computing techniques.
(2) Quantum Circuit Simulator Optimization for Quantum Algorithm Verification: To confront the high-cost problem of quantum algorithms verification on real quantum processors, my research explores optimization solutions for quantum circuit simulation, leveraging distributed systems, quantum circuit compilation techniques, and the sparsity of quantum states.
(3) Quantum Machine Learning-based Fault-Tolerance Techniques for Noisy Intermediate-Scale Quantum Computers: In response to the significant noise challenges in advanced quantum computers, my research explores automated error correction and mitigation solutions based on quantum machine learning and quantum neural architecture search techniques.

Teaching Experience: I have had a deep passion for education since a young age. During my Master's and Ph.D. studies, my supervisor's rigorous guidance further fueled my strong interest in research. So far, I have participated in the research guidance of 14 students and contributed to the revision of my supervisor's textbooks. And, I have also served as a teaching assistant for two courses. During my undergraduate stage, I worked as a peer tutoring teacher and was honored with the "Outstanding Peer Tutor" award multiple times. These experiences have helped me accumulate valuable teaching experience.

Broad Domestic and International Collaboration: Currently, our group has established extensive collaborations with several renowned universities, including the University of Pittsburgh, George Mason University, the University of Connecticut, the University of Texas at Dallas, The Chinese University of Hong Kong, The Hong Kong Polytechnic University, City University of Hong Kong, East China Normal University, Chongqing University, and Xiamen University, etc.

Education/Work Experience

George Mason University, United States 2024.09 - Present

Postdoctoral Research Fellow, Department of Electrical and Computer Engineering
Supervisor: Porf. Weiwen Jiang

The Chinese University of Hong Kong, Hong Kong 2024.03 - 2024.08

Research Assistant, Department of Computer Science and Engineering
Supervisor: Prof. Zili Shao

East China Normal University, Shanghai 2021.08 - 2024.06

Doctor of Engineering, Computer Software and Theory (Successive Master's and Doctoral program)
Supervisor: Edwin Hsing-Mean Sha

East China Normal University, Shanghai 2019.09 - 2021.08

Master, Computer Science and Technology (graduate school admission by recommendation)
Supervisor: Edwin Hsing-Mean Sha

Nanjing Agricultural University, Nanjing 2015.09 - 2019.06

Bachelor of Engineering, Major in Network Engineering *Ranking: 2/66*

PUBLICATIONS

Conference/Journal Papers

1. **Yuhong Song,** Weiwen Jiang, Bingbing Li, Panjie Qi, Qingfeng Zhuge, Edwin Hsing-Mean Sha, Sakyasingha Dasgupta, Yiyu Shi, and Caiwen Ding. "Dancing along Battery: Enabling Transformer with Run-time Reconfigurability on Mobile Devices." *In 2021 58th ACM/IEEE Design Automation Conference (DAC)*, pp. 1003-1008. IEEE, 2021. **(CCF-A, Acceptance Rate: 22.9%)**

2. **Yuhong Song,** Edwin Hsing-Mean Sha, Qingfeng Zhuge, Wenlong Xiao, Qijun Dai, and Longshan Xu. "QuanPath: Achieving One-Step Communication for Distributed Quantum Circuit Simulation." *Quantum Information Processing*, 2024, 23(1): 1-35. **(SCI JCR Q1)**

3. **Yuhong Song,** Edwin Hsing-Mean Sha, Qingfeng Zhuge, Rui Xu, and Han Wang. "Efficient Algorithm for Full-State Quantum Circuit Simulation with DD Compression while Maintaining Accuracy." *Quantum Information Processing*, 2023, 22(11): 1-25. **(SCI JCR Q1)**

4. **Yuhong Song,** Edwin Hsing-Mean Sha, Qingfeng Zhuge*, Longshan Xu, and Zili Shao. "Mera: Memory Reduction and Acceleration for Quantum Circuit Simulation via Redundancy Exploration." *In 2024 42nd IEEE International Conference on Computer Design (ICCD)*. IEEE, 2024. **(CCF-B, Acceptance Rate: 28%)**

5. **Yuhong Song,** Edwin Hsing-Mean Sha, Qingfeng Zhuge, Rui Xu, Xiaowei Xu, Bingzhe Li, and Lei Yang. "Hardware-Aware Neural Architecture Search for Stochastic Computing-based Neural Networks on Tiny Devices." *Journal of Systems Architecture* 135 (2023): 102810. **(CCF-B)**

6. **Yuhong Song,** Edwin Hsing-Mean Sha, Qingfeng Zhuge, Rui Xu, and Han Wang. "RR-SC: Run-Time Reconfigurable Framework for Stochastic Computing-Based Neural Networks on Edge Devices." *Journal of Computer Research and Development*, 2024, 61(4): 840-855. **(CCF-T1)**

7. **Yuhong Song,** Edwin Hsing-Mean Sha, Qingfeng Zhuge, Rui Xu, Yongzhuo Zhang, Bingzhe Li, and Lei Yang. "BSC: Block-based Stochastic Computing to Enable Accurate and Efficient TinyML." *In 2022 27th Asia and South Pacific Design Automation Conference (ASP-DAC)*, pp. 314-319. IEEE, 2022. **(CCF-C, Acceptance Rate: 36.5%)**

8. Jin Xue, **Yuhong Song**, Yang Guo, Zili Shao. "Ensuring Data Freshness for In-Storage Computing with Cooperative Buffer Manager." *In 2025 Design, Automation & Test in Europe Conference (DATE)*. IEEE, 2025. **(Accepted, CCF-B)**

9. Panjie Qi, **Yuhong Song,** Hongwu Peng, Shaoyi Huang, Qingfeng Zhuge, and Edwin Hsing-Mean Sha. "Accommodating Transformer onto FPGA: Coupling the Balanced Model Compression and FPGA-Implementation Optimization." *In Proceedings of the 2021 on Great Lakes Symposium on VLSI (GLSVLSI)*, pp. 163-168. 2021. **(CCF-C)**

10. Yixuan Du, Edwin Hsing-Mean Sha, **Yuhong Song,** Yibo Guo, Longshan Xu, and Qingfeng Zhuge. "MuDP: Multi-Granularity Data Placement for Uniform Loops on SPM-DRAM Architectures to Minimize Latency." *Frontiers of Computer Science*, 2025, 19(5): 195107. **(CCF-B)**

11. Rui Xu, Edwin Hsing-Mean Sha, Qingfeng Zhuge, **Yuhong Song,** and Han Wang. "Optimizing Data Placement for Hybrid SRAM+Racetrack Memory SPM in Embedded Systems." *IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems* 42, no. 3 (2022): 847-859. **(CCF-A)**

12. Rui Xu, Edwin Hsing-Mean Sha, Qingfeng Zhuge, **Yuhong Song,** and Han Wang. "Loop Interchange and Tiling for Multi-Dimensional Loops to Minimize Write Operations on NVMs." *Journal of Systems Architecture* 135 (2023): 102799. **(CCF-B)**

13. Rui Xu, Edwin Hsing-Mean Sha, Qingfeng Zhuge, **Yuhong Song,** and Jingzhi Lin. "Optimal Loop Tiling for Minimizing Write Operations on NVMs with Complete Memory Latency Hiding." *In 2022 27th Asia and South Pacific Design Automation Conference (ASP-DAC)*, pp. 389-394. IEEE, 2022. **(CCF-C)**

14. Panjie Qi, Edwin Hsing-Mean Sha, Qingfeng Zhuge, Hongwu Peng, Shaoyi Huang, Zhenglun Kong, **Yuhong Song,** and Bingbing Li. "Accelerating Framework of Transformer by Hardware Design and Model Compression Co-Optimization." *In 2021 IEEE/ACM International Conference On Computer Aided Design (ICCAD)*, pp. 1-9. IEEE, 2021. **(CCF-B)**

15. Han Wang, Qingfeng Zhuge, Edwin Hsing-Mean Sha, Rui Xu, and **Yuhong Song**. "Optimizing Efficiency of Machine Learning Based Hard Disk Failure Prediction by Two-Layer Classification-Based Feature Selection." *Applied Sciences,* Vol. 13, No. 13 (2023): 7544. **(SCI JCR Q2)**

16. Jialin Liu, Edwin Hsing-Mean Sha, Qingfeng Zhuge, Rui Xu, and **Yuhong Song**. "Efficient Checkpoint under Unstable Power Supplies on NVM based Devices." *In 2022 IEEE HPCC/DSS/SmartCity/DependSys*, pp. 1846-1853. IEEE, 2022. **(EI Index)**

17. Edwin Hsing-Mean Sha, Yeteng Liao, Qingfeng Zhuge, Rui Xu, **Yuhong Song,** and Jialin Liu. "Pseudo-Log: Restore Global Data Facing Power Failures with Minimum NVM Write." *In 2022 IEEE HPCC/DSS/SmartCity/DependSys*, pp. 2027-2030. IEEE, 2022. **(EI Index)**

18. Yongzhuo Zhang, Edwin Hsing-Mean Sha, Qingfeng Zhuge, **Yuhong Song**. "Parallel Block-based Stochastic Computing with Adapted Quantization." *Journal of East China Normal University (Natural Science)*, Vol. 2024, No. 2 (2024): 76-85. **(Chinese Core Journal)**

19. Han Wang, Edwin Hsing-Mean Sha, **Yuhong Song,** Longshan Xu, Qingfeng Zhuge. "量子计算融入计算机导论课程的教学探索." *Computer Education*, Vol. 2023, No.8 (2023):182-185. **(CCF-T2)**

20. Edwin Hsing-Mean Sha, Han Wang, Longshan Xu, **Yuhong Song,** Qingfeng Zhuge. "ChatGPT 对计算机基础教育的挑战分析与应对策略." *Computer Education*, Vol. 2023, NO. 11 (2023):51-54. **(CCF-T2, 20th Anniversary Top 20 Papers Award)**

Patents and Software Copyrights

1. Edwin Hsing-Mean Sha, **Yuhong Song**, Qingfeng Zhuge. "一种基于量子线路的高效模拟方法." **(Granted Patent, No. ZL 2022 1 1299951.4)**

2. Edwin Hsing-Mean Sha, **Yuhong Song**, Qingfeng Zhuge. "一种基于分布式系统的高效量子线路模拟方法." **(Disclosed Patent, No. CN 117291271 A)**

3. Longshan Xu, **Yuhong Song**, Edwin Hsing-Mean Sha, Qingfeng Zhuge. "eQuantum 量子计算学习平台." **(Software Copyrights, No. 2022SR1124626)**

TEACHING EXPERIENCE

Teaching Assistant Experience

Computer Organization and Architecture (*COMS0031131014.02*), ECNU — Spring 2021

Introduction to Computer Science (*COMS0031131026.01*), ECNU — Fall 2021

Textbook Editing and Revision Experience

《编程导论——以 Python 为舟》(Tsinghua University Press) — 2nd Edition

《计算机科学导论——以 Pyhton 为舟》(Tsinghua University Press) — 4th Edition

Research Guidance and Student Affairs

Research guidance for a total of 14 students

Student Team Leader (team over 30 members)

Secretary of the Ph.D. First Party Branch, School of Computer Science and Technology 2023-2024

Academic Services

Review Experience

Reviewed for top-tier international conferences, such as DAC, AAAI, DATE, ICCD, ASP-DAC, etc.

Reviewed for top-tier international journals, such as TC, TCAD, TECS, TNNLS, etc.

TPC Member of IEEE International Conference on Quantum Computing and Engineering (QCE24)

Academic Conference Organization Experience

Co-organizer (Program Committee) for the StableQ Workshop, 2024.

Student organizer for the Symposium on Big Data and Intelligent Systems Technology, 2023.

One of student organizers for the ESWEEK International Conference, 2022.

Project Experience

面向资源受限嵌入式系统的深度神经网络软硬件协同设计与优化

Grant No. 62372183, *NSFC General Program*, Core Team Member 2024.01 - 2027.12

高性能低开销的量子计算模拟系统关键技术及算法研究

Grant No. 62372182, *NSFC General Program*, Core Team Member 2024.01 - 2027.12

面向高效能智能计算的异构嵌入式流水线设计与系统优化

Grant No. 61972154, *NSFC General Program*, Participant 2020.01 - 2023.12

基于学生成长大数据的成长监测系统与教育人工智能大脑关键技术研究

Grant No. 20511101600, *Shanghai S&T Commission Project*, Participant 2019.01 - 2023.12

面向持久化内存及分布式架构的低开销用户态文件系统软件研究

Lenovo Collaboration Project, Participant 2021.01 - 2021.12

Honors and Awards

Outstanding Graduate of East China Normal University 2024.05

Huaxin Scholarship, East China Normal University 2023.12

Outstanding Student of East China Normal University 2023.12

Huaxin Scholarship, East China Normal University 2022.12

Outstanding Student Leader of East China Normal University 2022.12

Social Scholarship, East China Normal University 2021.12

Other several honors and awards at NJAU, including the National Scholarship, First-Class Scholarship for Excellent Students, Second-Class Scholarship for Excellent Students, Outstanding Student, Outstanding Student Leader, Outstanding Graduate, and competition awards. 2015-2019