Qirui Zhang

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Education

University of Michigan, Ann Arbor, Michigan, USA — Sep. 2018 – Jun. 2024
Doctor of Philosophy in Electrical and Computer Engineering
Thesis: "Domain-Specific Acceleration: From Efficient Vision Processing Hardware to High-Performance Quantum Computing Software"
Advisor: Prof. Dennis Sylvester, also closely work with Prof. David Blaauw and Prof. Hun-Seok Kim

University of Michigan, Ann Arbor, Michigan, USA — Sep. 2018 – Apr. 2021
Master of Science in Electrical and Computer Engineering

Shanghai Jiao Tong University, Shanghai, China — Sep. 2014 – Jun. 2018
Bachelor of Science in Engineering in Microelectronics Science and Engineering
Thesis: "Algorithm for Reduction of Motion Artifact in PPG Signal and Its Implementation"
Advisor: Prof. Guoxing Wang

University of California, **Los Angeles**, California, USA — Jul. 2017 – Sep. 2017
The Cross-disciplinary Scholars in Science and Technology (CSST) Program, Advisor: Prof. Dejan Marković

Professional Experience

Research Fellow, University of Michigan, Ann Arbor — Since Jul. 2024
- Michigan Integrated Circuit Laboratory (MICL)

Graduate Student Research Assistant, University of Michigan, Ann Arbor — Sep. 2018 – Jun. 2024
- Michigan Integrated Circuit Laboratory

ASIC Design Efficiency Engineer Intern, NVIDIA, Santa Clara — May. 2022 – Aug. 2022
- Streaming Multiprocessor ASIC performance

Graduate Student Instructor, University of Michigan, Ann Arbor — Jan. 2022 – Apr.2022
- EECS 627 – VLSI Design II

Honors and Awards

- Best Paper Award, *IEEE ASAP 2023* — Jul. 2023
- Finalist, *Qualcomm Innovation Fellowship 2023 North America* — Apr. 2023
- Best Paper Award, *ACM tinyML Research Symposium 2022* — Mar. 2022
- Excellent Undergraduate Thesis (Top 1%), Shanghai Jiao Tong University — Jun. 2018
- Outstanding Graduate, Shanghai Jiao Tong University — Jun. 2018
- World Honorable Mention (2nd Place), *2016-2017 IEEE CASS Student Design Competition* — Jun. 2017
- Cross-disciplinary Scholars in Science and Technology Scholarship, UCLA — May. 2017
- Irving T. Ho Memorial Scholarship, Irving T. Ho Memorial Foundation — Sep. 2016

Publications

Journals

1. **Q. Zhang** *et al.*, "RoboVisio: A micro-robot vision domain-specific SoC for autonomous navigation enabling fully-on-chip intelligence via 2-MB eMRAM," in *IEEE Journal of Solid-State Circuits*, 2024.

2. **Q. Zhang** *et al.*, "An ultra-low-power H.264/AVC intra-frame image compression accelerator for intelligent event-driven IoT imaging systems," in *IEEE Solid-State Circuit Letters*, 2024.

3. Z. Fan, **Q. Zhang** *et al.*, "AIMMI: Audio and image multi-modal intelligence via a low power SoC with 2M-Byte on-chip MRAM for IoT devices," in *IEEE Journal of Solid-State Circuits*, 2024.

4. H. Yang, J.-H. Seol, R. Rothe, Z. Fan, **Q. Zhang** *et al.*, "A 1.5-μW fully-integrated keyword spotting SoC in 28-nm CMOS with skip-RNN and fast-settling analog frontend for adaptive frame skipping," in *IEEE Journal of Solid-State Circuits*, 2024. [**Invited Paper**]

5. **Q. Zhang** *et al.*, "An open-source and autonomous temperature sensor generator verified with 64 instances in SkyWater 130nm for comprehensive design space exploration," in *IEEE Solid-State Circuits Letters*, 2022.

6. H. An, S. Schiferl, S. Venkatesan, T. Wesley, **Q. Zhang** *et al.*, "An ultra-low-power image signal processor for hierarchical image recognition with deep neural networks," in *IEEE Journal of Solid-State Circuits*, 2021. [**Invited Paper**]

7. J. Wang, H. An, **Q. Zhang** *et al.*, "A 40-nm ultra-low leakage voltage-stacked SRAM for intelligent IoT sensors," in *IEEE Solid-State Circuits Letters*, 2021. [**Invited Paper**]

8. **Q. Zhang** *et al.*, "A digital signal processor (DSP)-based system for embedded continuous-time cuffless blood pressure monitoring using single-channel PPG signal," in *Science China Information Sciences*, 2020.

9. M. Wang, Z. Li, **Q. Zhang** *et al.*, "Removal of motion artifact in photoplethysmograph sensors during intensive exercise for accurate heart rate calculation based on frequency estimation and notch filtering," in *Sensors*, 2019. [**SJTU Excellent Undergraduate Thesis**]

Conference Papers

1. **Q. Zhang** *et al*., "Quantum circuit simulation with fast tensor decision diagram," *2024 25th International Symposium on Quality Electronic Design (ISQED)*.

2. P. Abillama, **Q. Zhang** *et al.*, "A 22nm 9.51 TOPS/W neural engine with 2MB MRAM leveraging sparse-orthogonal walsh-hadamard transform computations and dynamic power gating," *2024 IEEE European Solid-State Electronics Research Conference (ESSERC)*.

3. Z. Fan, **Q. Zhang** *et al.*, "TaskFusion: an efficient transfer learning architecture with dual delta sparsity for multi-task natural language processing," *2023 ACM/IEEE 50th Annual International Symposium on Computer Architecture (ISCA)*. [**Qualcomm Innovation Fellowship Finalist**]

4. H. An, Y. Chen, Z. Fan, **Q. Zhang** *et al.*, "An 8.09TOPS/W neural engine leveraging bit-sparsified sign-magnitude multiplications and dual adder trees," *2023 IEEE International Solid-State Circuits Conference (ISSCC)*.

5. J. -H. Seol, H. Yang, R. Rothe, Z. Fan, **Q. Zhang** *et al.*, "A 1.5 μW end-to-end keyword spotting SoC with content-adaptive frame sub-sampling and fast-settling analog frontend," *2023 IEEE International Solid-State Circuits Conference (ISSCC)*.

6. P. Abillama, Z. Fan, Y. Chen, H. An, **Q. Zhang** *et al.*, "SONA: An accelerator for transform-domain neural networks with sparse-orthogonal weights," *2023 IEEE 34th International Conference on Application-specific Systems, Architectures and Processors (ASAP)*. [**Best Paper Award**]

7. **Q. Zhang** *et al.*, "A 22nm 3.5TOPS/W flexible micro-robotic vision SoC with 2MB eMRAM for fully-on-chip intelligence," *2022 IEEE Symposium on VLSI Technology and Circuits*.

8. Z. Fan, H. An, **Q. Zhang** *et al.*, "Audio and image cross-modal intelligence via a 10TOPS/W 22nm SoC with back-propagation and dynamic power gating," *2022 IEEE Symposium on VLSI Technology and Circuits*.

9. A. Bejarano-Carbo, H. An, K. Choo, S. Liu, **Q. Zhang** *et al.*, "Millimeter-scale ultra-low-power imaging system for intelligent edge monitoring," *2022 tinyML Research Symposium*. [**Best Paper Award**]

10. H. An, S. Venkatesan, S. Schiferl, T. Wesley, **Q. Zhang** *et al.*, "A 170μW image signal processor enabling hierarchical image recognition for intelligence at the edge," *2020 IEEE Symposium on VLSI Circuits*.

11. J. Wang, H. An, **Q. Zhang** *et al.*, "1.03pW/b ultra-low leakage voltage-stacked SRAM for intelligent edge processors," *2020 IEEE Symposium on VLSI Circuits*.

12. **Q. Zhang** *et al.*, "Motion artifact removal for PPG signals based on accurate fundamental frequency estimation and notch filtering," *2018 40th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC)*. [**SJTU Excellent Undergraduate Thesis**]

13. Q. Xie, **Q. Zhang** *et al.*, "Combining adaptive filter and phase vocoder for heart rate monitoring using photoplethysmography during physical exercise," *2018 40th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC)*.