

Quantum Instruction Set Design for Superconducting Processors: A Computer Science Perspective

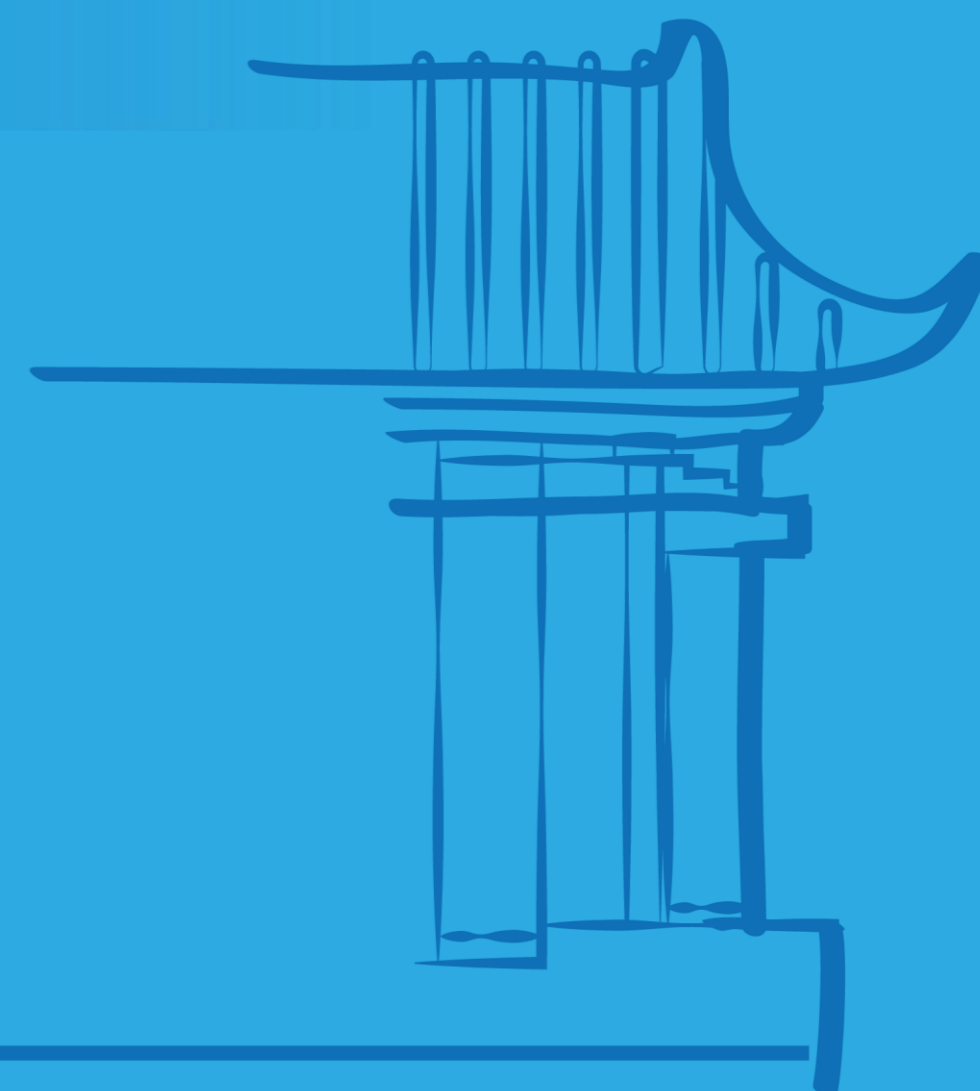


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Abstract

The integration of quantum hardware and software is epitomized by the quantum instruction set, yet a tangible disconnect persists in translating theoretical quantum operations into practical instructions for algorithm deployment and their subsequent realization on actual quantum hardware. This presentation will explore the evolution and optimization of quantum instruction sets, focusing on achieving high-fidelity execution and streamlining quantum algorithm programming. We will specifically examine a range of effective strategies for executing single- and two-qubit operations, which promise to substantially elevate system performance. Additionally, we will highlight the extensive opportunities available for future advancements in the architecture of quantum instruction sets.

Biography

Jianxin Chen was a Quantum Scientist and the head of System team of DAMO Quantum Laboratory (DAMO-QL), a division of Alibaba Group's global research institute DAMO Academy. Jianxin earned both his Bachelor's and Ph.D. degrees in computer science from Tsinghua University. Before joining Alibaba, he served as a Hartree fellow at the Joint Center for Quantum Information and Computer Science at the University of Maryland. Jianxin's primary research focus centers on the development of a robust and fault-tolerant quantum computer system. To date, he has authored and published over 70 research papers in top journals such as PRL, PRX Quantum, Nature Computational Science, as well as top conferences such as QIP and ASPLOS. Jianxin is an IEEE senior member and he has actively contributed to the program committees of prestigious conferences such as QIP (Quantum Information Processing), TQC (The Theory of Quantum Computation, Communication, and Cryptography), and IEEE Quantum Week.