Zhuo Chen

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EDUCATION

Bachelor of Computer Science and Technology **Expected Fall 2025**

Institute for Interdisciplinary Information Sciences (Yao Class), Tsinghua University *Beijing, China*

- **Selected Coursework: Quantum Communications and Cryptography, Quantum Computer Science, Quantum Computing Interdisciplinary Applications, Machine Learning, Theory of Computation, Algorithm Design, The Physics of Information, Database Systems, Computer Architecture, Game Theory, Numerical Analysis, Electrodynamics, etc.**
- **GPA:**3.73/4.00

RESEARCH INTEREST

I am interested in addressing theoretical **quantum** challenges through the perspectives of computer science, mathematics, and physics. I am recently intrigued by **entanglement** and **nonlocality** phenomena, and the **learning theory** of quantum systems.

RESEARCH EXPERIENCE

Student Research Assistant **April 2024 - August 2024**

Department of Computer Science, The University of Hong Kong *Hong Kong, China*

- Achieve theoretical progress in the quantum entanglement and nonlocality theory by developing a new measure of entanglement magnitude related to detection difficulty. A related paper is in progress, and I am the first author.
- Collaborate and coordinate with Prof. *Qi Zhao* and his group members.

PUBLICATION

- Zhuo Chen, *et al*. (2024). *Optimizing Circuit Reusing and its Application in Randomized Benchmarking* - https://arxiv.org/abs/2407.15582. (Under review by *Quantum* journal)

CURRENT RESEARCH

- *Detecting Entanglement and Nonlocality with Minimum Observable Length* - A theoretical work examining various entanglement forms and nonlocality, constructing a new analytical framework for all entanglement types with respect to the detection difficulty. (Authoring the thesis as the first author; work in progress.)
- *Adaptive Circuit Reusing for Randomized Benchmarking Protocols* - A theoretical work aimed at reducing the experimental costs of "Randomized Benchmarking" tasks through adaptive circuit reuse. (Authoring the thesis as the first author; work in progress.)

CONFERENCE PRESENTATIONS

Poster Presentations

- **Zhuo Chen**, *et al*. *Optimizing Circuit Reusing and its Application in Randomized Benchmarking.* Poster session presented at *CPS International Young Scientists Forum on Quantum Computing* (2024), China. (*Poster*)

TECHNICAL SKILLS

Programming language: C/C++, Python, Matlab
Technologies/Frameworks: Quantum Software Programming, Numerical Analysis, Machine Learning Data Training, Computer System Architecture Simulation, Type-Sate Back-End Programming.

PROJECTS

Random Benchmarking Protocol for Non-Clifford Gates **May 2023 - September 2024**

"Students Research Training" Project

- Optimized experimental costs by analyzing and employing circuit reuse strategies for various benchmarking protocols.
- Developed programs for simulating numerical performance and visualizing noise parameters.
- Independently completed the entire project and produced the associated research paper (as previously mentioned).

Solving Ground State Problem via QITE algorithm **October 2023 - January 2024**

Curriculum Project

- A theoretical research project in collaboration with Chendi Yang, Chu Zhao, and Ziru Zheng.
- Realized Quantum imaginary-time evolution (QITE) algorithm with quantum software programming tool *Qiskit*.
- Conduct comparison of efficiency between classical algorithm and QITE by numerical simulations.

***SPIN* Topology Design - https://github.com/zhuo-che21/SPIN/tree/master** **Summer 2023**

Curriculum Project

- A programming project in collaboration with Chu Zhao.
- Implemented fully adaptive deadlock-free routing algorithms for 3D-torus and 3D-mesh topologies on Synchronized Progress in Interconnection Networks (SPIN).
- Compared the performance of 2D and 3D deterministic routing algorithms on torus and mesh topologies, respectively, under various traffic modes.

"Wing" Database - https://github.com/zhuo-che21/wing-database-main **February 2023 - June 2023**

Curriculum Project

- Utilized a contemporary database constructed on the "Wing" framework.
- Employed a B+ tree data structure with $O(N \log N)$ complexity for search, insertion, and deletion operations.

"Health Kit" Applet - https://github.com/zhuo-che21/Health-Kit-Backends **Fall 2022**

Curriculum Project

- A programming project in collaboration with Chu Zhao, ZiRu Huang, and Bo Yu.
- Constructed a back-end database with type-safe programming.
- Monitor and record users' health status based on their travel routes to curb the spread of epidemics across regions.

"Ffmpeg" Multimedia Processing - https://github.com/zhuo-che21/ffmpeg **Summer 2022**

Curriculum Project

- Intercepted key video frames to create video overview diagrams.

UNIVERSITY SERVICE

"Gu Ben Plan" Leader **2021-2024**

Institute for Interdisciplinary Information Sciences, Tsinghua University

- Organize book discussion activities for students in our department every semester.
- Invite lecturers to discuss books and share their reading experiences.

HONORS AND AWARDS

- Friends of Tsinghua—Nanjing Turing Institute of Artificial Intelligence Scholarship 2023
- Friends of Tsinghua—Huawei Scholars Scholarships 2022
- Tsinghua University National Freshman Scholarship 2021
- 37th Chinese Physics Olympiad (CPhO) Competition Gold Award (National Team Candidate) 2020