

Jiahan Chen

◇ Email: jjahanchen527@gmail.com

◇ Tel: +86 15596171527

◇ ORCID: [0009-0002-9717-3647](https://orcid.org/0009-0002-9717-3647)

INTERESTS

Quantum Information Theory, Quantum Error Correction, Artificial Intelligence

EDUCATION

M.S. in Computer Science and Technology

09/2022 - Present

Harbin Institute of Technology, Shenzhen

Research focus: Quantum Error Correction, advised by Prof. Xuan Wang

GPA: 3.3/4.0

B.S. in Computer Science and Technology

09/2018 - 06/2022

Xi'an Jiaotong University

GPA: 3.5/4.3

ACADEMIC EXPERIENCES

Designing Competitive Belief Propagation Decoding for Surface Codes

10/2023 - 02/2025

Master's degree project

- Improved BP's message update rules and initial probabilities inspired by gradient optimization.
- Added correlated belief to enhance the prior, made it directly adapt to detector error model.
- Achieved a 1 to 3 orders of magnitude improvement in accuracy without post-processing, under both code capacity and circuit-level noise models, while enabling constant-cost parallel implementation

Implementation and Analysis of Quantum Discrete Adiabatic Algorithm for Solving Linear Systems in the NISQ Era

05/2024 - 07/2024

From 3rd CCF "Pilot Cup" General Track

- Implemented the quantum discrete adiabatic algorithm for arbitrary matrices based on LCU block encoding and qubitization, achieving a 99.99% state fidelity in the test case
- Analyzed the algorithm's inherent noise resilience under a simplified noise model, and assessed the requirements and overhead for quantum error correction

Designing High-dimensional Quantum XYZ Product Codes for Biased Noise

03/2024 - 07/2024

Research within Computer Application Research Center

- Utilized the chain complex to generalize the construction of 3D product codes, proposing 4D XYZ product constructions using either four classical codes or two CSS codes
- Simulated and compared the performance of 4D XYZ product codes under Z-biased noise, showing superior error-correcting capability compared to CSS codes from 4D homological product

Designing Tanner-Graph-Recursive-Expansion Code with High Rate

11/2023 - 02/2024

Research within Computer Application Research Center

- Constructed high-rate XZ-TGRE codes through Tanner graph recursive expansion
- Applied hypergraph product and concatenation to TGRE codes, achieving high code rate and error-correction capability under biased noise, separately

PUBLICATIONS

Zhengzhong Yi, Zhipeng Liang, **Jiahao Chen**, Kaixin Zhong, Et al., *Improved belief propagation decoding algorithm based on decoupling representation of Pauli operators for quantum stabilizer codes*, **Quantum Information Processing**, 2025.

Zhengzhong Yi, Zhipeng Liang, Zicheng Wang, **Jiahao Chen**, Et al., *Recursive expansion of Tanner graph: a method to construct stabilizer codes with high coding rate*, **Physical Review A**, 2024, 110(3): 032425.

Jiahao Chen, Zhengzhong Yi*, Zhipeng Liang, and Xuan Wang, *Improved Belief Propagation Decoding Algorithms for Surface Codes*, [arXiv:2407.11523](#) (**IEEE Transactions on Quantum Engineering**, under revision)

Zhipeng Liang, Zhengzhong Yi, Fusheng Yang, **Jiahao Chen**, Et al., *High-dimensional quantum XYZ product codes for biased noise*, [arXiv:2408.03123](#)

Jiahao Chen, Shuhan Qi*, Yifan Li, Zeyu Dong, Et al., *KnobTree: Intelligent Database Parameter Configuration via Explainable Reinforcement Learning*, [arXiv:2406.15073](#)

HONORS

First-Class Graduate Scholarship	2023, 2022
Second Prize (6th Place out of 306 teams) in the 3rd CCF "Pilot Cup" General Track	2024
Second Prize (2nd Place overall) in the 2nd SpinQ Cup Quantum Computing Challenge	2023
Excellence Award (6th Place overall) in the Tencent Kaiwu AI Open Competition	2023
Outstanding League Cadres	2023

OTHER EXPERIENCES

Open-Source Project - QEC Decoding Experiment Framework 08/2024 - 10/2024

Independently Developed

- Implemented a framework for comparison of the performance of different error correction codes and decoding algorithms, supporting code capacity noise, phenomenological noise, and circuit-level noise model.
- Developed and optimized BP decoding on GF(2) and GF(4) in C++, integrated error correction codes and decoding algorithms studied by the research group, provided interfaces for adding new classes, and open-sourced the project on [GitHub](#).

Teaching Assistant

- *Theory of computation* Fall, 2023
- *Network and system security* Spring, 2023

SKILLS

Basics	Quantum Computation and Quantum Information (Nielsen and Chuang), Machine Learning
Utilities	Python (NumPy, PyTorch, QPanda), C++, MATLAB, LaTeX
Language	English (IELTS 7.0), Mandarin (native)