JUNYU FAN

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EDUCATION

TU Delft — Delft, NL
Master of Applied Physics — Sept.2022 - Sept.2024

- GPA: 8.7/10.0 (Top 5%)
- Graduated with *cum laude*
- Relevant Courses: Master Thesis Project (9.0), Advanced Quantum Mechanics (9.5), Mesoscopic Physics (10.0), Advanced Electrodynamics (9.0), Quantum Communication and Cryptography (9.0), Computational Physics (8.0), Object Oriented Scientific Programming with C++ (7.5)

Fudan University — Shanghai, CN
Bachelor of Engineering in Nuclear Engineering and Technology — Sept.2018 - June.2022

- GPA: 3.5/4.0 (Top 10%)
- Awarded The Shanghai Institute of Applied Physics Scholarship in 2021 (awarded to 1st-ranked students)
- Relevant Courses: Linear Algebra (A), Advanced Mathematics (A), Methods of Mathematical Physics (A-), Probability Theory and Mathematical Statistics (A-), Programming with C (A), Programming with Python (B+), Fundamentals of Digital Logic (A)

Yale University — New Haven, US
Exchange Student (Summary Program) — Jul.2019 - Aug.2019

PUBLICATIONS

1. Matthew Steinberg, **Junyu Fan**, Jens Eisert, Sebastian Feld, Alexander Jahn, and Chunjun Cao. Universal fault-tolerant logic with heterogeneous holographic codes. *PRX Quantum* (accepted). A poster for *TQC 2025, QEC25*. *arXiv preprint arXiv*:2504.10386, 2025.
2. Jue Xu, Chu Zhao, **Junyu Fan**, and Qi Zhao. Exponentially decaying quantum simulation error with noisy devices. *arXiv preprint arXiv*:2504.10247, 2025.
3. **Junyu Fan, Matthew Steinberg**, Alexander Jahn, Chunjun Cao, and Sebastian Feld. Overcoming the zero-rate hashing bound with holographic quantum error correction. *IOPscience Quantum Science and Technology* (under major revision). *arXiv preprint arXiv*:2408.06232, 2024.
4. **Junyu Fan**, Matthew Steinberg, Alexander Jahn, Chunjun Cao, Aritra Sarkar, and Sebastian Feld. LEGO HQEC: A software tool for analyzing holographic quantum codes. *arXiv preprint arXiv*:2410.22861, 2024. https://github.com/QML-Group/HQEC.
5. Matthew Steinberg, **Junyu Fan**, Robert J Harris, David Elkouss, Sebastian Feld, and Alexander Jahn. Far from perfect: Quantum error correction with (hyperinvariant) evenbly codes. *Quantum,* 9:1826, 2025.
6. **Junyu Fan**, Zihuan Jiang, Yuyuan Qian, Jialin Liu, Pengcheng Xu, Liangyu Huang, Zhencen He, Yaming Zou, Jiguang Li, Chongyang Chen, et al. Optical lines of Ru^{21+} to Ru^{24+} ions. *Atoms*, 10(4):154, 2022.
7. Yajing Li, Yintao Wang, **Junyu Fan**, Ran Si, Jiguang Li, Mingwu Zhang, Liangyu Huang, Jun Xiao, Yaming Zou, Baoren Wei, et al. Precise wavelength determination of the $4s^24p\ ^2p_{3/2}$–$^2p_{1/2}$ transition in Mo^{11+} and Ru^{13+} ions. *Journal of Physics B: Atomic, Molecular and Optical Physics*, 54(23):235001, 2022.

RESEARCH EXPERIENCE

Shenzhen Institute for Quantum Science and Engineering — Shenzhen, CN
Research Intern — Dec.2024 - Jun.2025
A Theory of Intrinsic Measurement-Free Quantum Error Correction in Spin Qubits

- Developed a measurement-free quantum error correction scheme based on Fermionic property of electrons, which equivalently maps the quantum error correction feedback problem to a four-color linear separability problem on a hypercube, offering unique advantages for spin qubit platforms.

QuTech — Delft, NL
Research Intern — Sep.2023 - May.2024
Biased Noise Study for Holographic Quantum Error Correcting Codes

- Developed a program for operator push based on holographic tensor networks, automating tensor network operator push for the first time.
- Various decoders developed, including tensor network decoder, integer optimization decoder, and neural network decoder, have been developed to achieve near-optimal decoding.
- For the first time, a holographic error-correcting code with a 50% maximum threshold under all pure Pauli errors was discovered. It was also verified that this code exceeds the hashing bound under high bias.

Fudan University (Institute of Modern Physics) Shanghai, CN
Research Assistant Jan.2021 - Mar.2022
Accurate Measurement of Transition Spectra of Highly Charged Ruthenium Ions

- Aimed to precisely determine the wavelength of transition lines for highly charged Ru ions using an Electron Beam Ion Trap (EBIT), contributing to the development of Ru ion clocks and the study of variations in the fine structure constant.
- Measured and analyzed the data from M1 transition spectrum of Ru^{13+} ions, achieving a high precision measurement of the wavelength accurate to 0.002nm.

WORK EXPERIENCE

Aramco Overseas Company Delft, NL
Research Intern Jun.2024 - Aug.2024

- Proposed a signal pruning method for two-dimensional seismic sensing data, leveraging edge detection in combination with brightness variation statistics.
- Put forward an innovative hypothesis suggesting that the optimization difficulty of QUBO on quantum annealers may be influenced by the Hamming distance between the initial state and the global optimum, in addition to the traditionally considered energy barrier height. This hypothesis was partially validated on the D-Wave quantum annealer.
- The applicability of quantum acceleration for QUBO was classified using a random forest.

Scheme Capital Shanghai, CN
Business Analyst Intern Jul.2020 - Sep.2020

- Worked as a Business Analysis Intern at Scheme Capital, primarily responsible for industry research, investment case studies, financial modeling, and desktop research, assisting with due diligence processes.
- During my stay, participated in and completed several early-stage investment projects.

ADDITIONAL INFORMATION

Interests

- Music Producing, ITX Case Designing, Photography, Gaming (mostly 3A games)

Computer Skills

- Programming Languages: Python, C, C++, HTML+CSS
- Libraries: Numpy, TensorNetwork, Sympy, matplotlib, Gurobipy, PyTorch, pandas
- Tools: git, ssh, scp, nginx, docker
- Hardware Skills: PC/server assembly

Language Test Scores

- TOEFL iBT: Reading 29 + Listening 26 + Speaking 27 + Writing 27 = 109 (Took in 2021)

Standardized Test Scores

- GRE: Verbal 159 + Quantitative 169 = 328 (With Analytical Writing 3.5)