

Zixuan Liu

Quantum Information Researcher

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RESEARCH INTERESTS

My research lies at the intersection of quantum information and quantum foundations, with a focus on causality in physics, the identification and characterization of quantum behaviors in dynamical causal structures, and foundational principles underlying quantum information processing.

ACADEMIC CAREER

2024-now	Postdoctoral Researcher , Université libre de Bruxelles, Brussels Supervised by Ognyan Oreshkov
2023-2024	Postdoctoral Researcher , The University of Hong Kong, Hong Kong Supervised by Giulio Chiribella
2023-2023	Research Assistant , The University of Hong Kong, Hong Kong Supervised by Giulio Chiribella

EDUCATION

2019-2023	Ph.D. in Computer Science , The University of Hong Kong, Hong Kong Thesis: <i>Quantum information processing with indefinite input-output direction</i> . Supervisor: Giulio Chiribella.
2015-2019	B.Eng. in Computer Science , Zhejiang University, Hangzhou Chu Kochen Honors degree (400 out of 7000 students)

PUBLICATIONS AND PREPRINTS

Published Papers

- [1] **Zixuan Liu** and Giulio Chiribella. *Tsirelson bounds for quantum correlations with indefinite causal order*. Nature Communications 16, 3314 (2025).
[DOI](#) · [arXiv](#)
- [2] Yu Guo, **Zixuan Liu**, Hao Tang, Xiao-Min Hu, Bi-Heng Liu, Yun-Feng Huang, Chuan-Feng Li, Guang-Can Guo, and Giulio Chiribella. *Experimental demonstration of input-output indefiniteness in a single quantum device*. Physical Review Letters 132, 160201 (2024).
[DOI](#) · [arXiv](#)

- [3] **Zixuan Liu**, Ming Yang, and Giulio Chiribella. *Quantum communication through devices with indefinite input-output direction*. *New Journal of Physics* 25(4), 043017 (2023).
[DOI](#) · [arXiv](#)
- [4] Giulio Chiribella and **Zixuan Liu**. *Quantum operations with indefinite time direction*. *Communications Physics* 5, 190 (2022).
[DOI](#) · [arXiv](#)

Preprints

- [5] **Zixuan Liu** and Ognjan Oreshkov. *Parity erasure: a foundational principle for indefinite causal order*. arXiv preprint arXiv:2512.08635 (2025).
[arXiv](#)

EXPERTISE

- Quantum supermaps
- Operational probabilistic theories
- Semidefinite programming
- Quantum resource theories

TEACHING

- 2025-26 **Teaching assistant for the course INFO-H514 Quantum Information and Computation (Exercise Sessions)**
At École polytechnique de Bruxelles, Université libre de Bruxelles (ULB), Brussels.
- 2024-25 **Teaching assistant for the course INFO-H422 Theory of Information, Coding, Computing and Complexity (Exercise Sessions, Information Theory)**
At École polytechnique de Bruxelles, Université libre de Bruxelles (ULB), Brussels.
- 2021-23 **Teaching assistant for the course COMP3316 Quantum Information**
At Department of Computer Science, the University of Hong Kong, Hong Kong.
- 2019-21 **Teaching assistant for the course COMP2121 Discrete Mathematics**
At Department of Computer Science, the University of Hong Kong, Hong Kong.

PRESENTATIONS

Invited / Contributed Talks

- 2026 **Causalworlds**, Grenoble, France
Contributed talk on “Parity erasure: a foundational principle for indefinite causal order”.

- 2026 **Relativistic Quantum Information COST Action WG3 seminar**,
Online
Invited talk on “Parity erasure: a foundational principle for indefinite causal order”.
- 2026 **TaQC meeting**, Grenoble, France
Invited Talk on “Parity erasure: a foundational principle for indefinite causal order”.
- 2024 **Causalworlds**, Perimeter Institute for Theoretical Physics
Contributed talk on “Tsirelson bounds for quantum correlations with indefinite causal order”.
- 2024 **24th Asian Quantum Information Science Conference**, Sapporo, Japan
Contributed talk on “Tsirelson bounds for quantum correlations with indefinite causal order”.
- 2024 **The sixteenth Biennial IQSA conference quantum structures 2024**, Brussels, Belgium
Contributed talk on “Tsirelson bounds for quantum correlations with indefinite causal order”.
- 2024 **The 21st International Conference on Quantum Physics and Logic (QPL 2024)**, Buenos Aires, Argentina
Contributed talk on “Tsirelson bounds for quantum correlations with indefinite causal order”.
- Posters**
- 2026 **29th Annual Quantum Information Processing Conference**, Riga, Latvia
Poster presentation on “Parity erasure: a foundational principle for indefinite causal order”.
- 2025 **8th International Conference for Young Quantum Information Scientists**, Barcelona, Spain
Poster presentation on “Fundamental signaling limits in causally nonseparable processes”.
- 2025 **25th Asian Quantum Information Science Conference**, Hong Kong, China
Poster presentation on “Information causality for indefinite causal order”.
- 2025 **The 22nd International Conference on Quantum Physics and Logic (QPL 2025)**, Varna, Bulgaria
Poster presentation on “Information causality for indefinite causal order”.
- 2023 **26th Annual Conference on Quantum Information Processing**, Ghent, Belgium
Poster presentation on “Quantum operations with indefinite time direction”.

PROFESSIONAL SERVICE

2025 **Conference organization**, The 22nd International Conference on Quantum Physics and Logic (QPL 2025)

Reviewer for Quantum and PRX Quantum.