

# Zhian Jia \*

## PERSONAL DATA

ADDRESS: Centre for Quantum Technologies, NUS  
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RESEARCH BLOG: [Chronicle of Physics](#)  
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## ACADEMIC EXPERIENCE

SEP 2021 - PRESENT	Centre for Quantum Technologies, <b>National University of Singapore, Singapore</b> <i>Supervisor: Dagomir Kaszlikowski</i> <i>Research Fellow</i>
NOV 2018 - DEC 2019	Microsoft Station Q, Department of Mathematics, <b>University of California, Santa Barbara, California, United States</b> <i>Supervisor: Zhenghan Wang</i> <i>Visiting scholar program</i>
SEP 2017 - AUG 2018	Yau Mathematical Sciences Center, Department of Mathematical Sciences, <b>Tsinghua University, Beijing, China</b> <i>Supervisor: Liang Kong</i> <i>Visiting Ph.D.</i>

## EDUCATION

SEP 2015 - JUN 2021	CAS Key Laboratory of Quantum Information, <b>University of Science and Technology of China, Hefei, China</b> <i>Supervisor: Guang-Can Guo, Yu-Chun Wu</i> <i>PhD degree in Physics</i> Thesis: Classification, criteria and properties of quantum correlations and their applications in quantum many-body systems
SEP 2011 - JUN 2015	Institute of Super-microstructure and Ultrafast Process in Advanced Materials, School of Physics and Electronics, <b>Central South University, Changsha, China</b> <i>B.S. in Applied Physics</i> Thesis: Impurity effect of vacancy in two-dimensional crystals and the related applications in quantum Hall effect

## SELECTED AWARDS

2017	Guorui scholarship for graduate students
2016	National scholarship for graduate students
2016	The Best Presenters' Prize Talk title: monogamy as a fundamental quantum phenomenon The third PFUNT(Physics Five Universities,the National Top) PhD Student Forum

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- 2016 The Third Prize of Talk  
Talk title: graph theoretic approach to quantum contextuality  
The sixth graduate student academic annual meeting of USTC
- 2015 *The Outstanding Project Prize*  
project title: First Principle Method of Single Layer Graphene-like Material  
and Its Functional Devices Design  
College students' innovative and entrepreneurial project
- 2014 College scholarships of Physics and Electronics, Central South University
- 2010 *The Second Prize* of The 27th national physics olympiad, 2010.

## PUBLICATIONS AND PREPRINTS [\[GOOGLE SCHOLAR\]](#)

- Z. Jia, Dagomir Kaszlikowski, Sheng Tan, Boundary and domain wall theories of 2d generalized quantum double model, *JHEP07(2023)160*, [[arXiv:2207.03970](#)]
- Z. Jia, Sheng Tan, Dagomir Kaszlikowski, Liang Chang, On weak Hopf symmetry and weak Hopf quantum double model, *Communications in Mathematical Physics* **402**, 3045–3107 (2023), [[arXiv:2302.08131](#)]
- Xiangjing Liu, Z. Jia, Yixian Qiu, Fei Li, Oscar Dahlsten, Unification of spatiotemporal quantum formalisms: mapping between process and pseudo-density matrices via multiple-time states, [[arXiv:2306.05958](#)]
- Z. Jia, Dagomir Kaszlikowski, The spatiotemporal doubled density operator: a unified framework for analyzing spatial and temporal quantum processes, [[arXiv:2305.15649](#)]
- Z. Jia, Minjeong Song, Dagomir Kaszlikowski, Quantum space-time marginal problem: global causal structure from local causal information, [[arXiv:2303.12819](#)]
- Lu Wei, Z. Jia, Dagomir Kaszlikowski, Sheng Tan, Antilinear superoperator and quantum geometric invariance for higher-dimensional quantum systems, [[arXiv:2202.10989](#)]
- Z. Jia, Dagomir Kaszlikowski, Electric-magnetic duality of  $\mathbb{Z}_2$  symmetry enriched cyclic Abelian lattice gauge theory, [[arXiv:2201.12361](#)]
- Huan Cao, Ning-ning Wang, Z. Jia, Chao Zhang, Yu Guo, Bi-Heng Liu, Yun-Feng Huang, Chuan-Feng Li, Guang-Can Guo, Quantum simulation of indefinite causal order induced quantum refrigeration, *Phys. Rev. Research* **4**, L032029 (2022), [[arXiv:2101.07979](#)]
- Z. Jia, Lu Wei, Yu-Chun Wu, Guang-Can Guo, Quantum Advantages of Communication Complexity from Bell Nonlocality, *Entropy* **23** (6), 744 (2021)
- Z. Jia, Rui Zhai, Shang Yu, Yu-Chun Wu, and Guang-Can Guo, Hierarchy of Genuine Multipartite Quantum Correlations, *Quantum Inf Process* **19**, 419 (2020)
- Yu Meng, Shang Yu, Z. Jia, Yi-Tao Wang, Zhi-Jin Ke, Wei Liu, Zhi-Peng Li, Yuan-Ze Yang, Hang Wang, Yu-Chun Wu, Jian-Shun Tang, Chuan-Feng Li, Guang-Can Guo, Environment-induced sudden change of coherence in quantum systems, *Phys. Rev. A* **102**, 042415 (2020)
- Z. Jia, Lu Wei, Yu-Chun Wu, Guang-Can Guo, Guo-Ping Guo, Entanglement Area Law for Shallow and Deep Quantum Neural Network States, *New J. Phys.* **22** 053022 (2020)
- Z. Jia, Biao Yi, Rui Zhai, Yu-Chun Wu, Guang-Can Guo and Guo-Ping Guo, Quantum Neural Network States: A Brief Review of Methods and Applications, *Adv. Quantum Technol.* **2019**, 1800077
- Z. Jia, Yuan-Hang Zhang, Yu-Chun Wu, Liang Kong, Guang-Can Guo, and Guo-Ping Guo, Efficient Machine Learning Representations of Surface Code with Boundaries, Defects, Domain Walls and Twists, *Phys. Rev. A* **99**, 012307 (2019)

- Yuan-Hang Zhang, **Z. Jia**, Yu-Chun Wu, and Guang-Can Guo, An Efficient Algorithmic Way to Construct Boltzmann Machine Representations for Arbitrary Stabilizer Code, [[arXiv:1809.08631](#)]
- **Z. Jia**, Rui Zhai, Bai-Chu Yu, Yu-Chun Wu, and Guang-Can Guo, Entropic No-Disturbance as a Physical Principle, *Phys. Rev. A* **97**, 052128 (2018)
- Shang Yu, Chang-Jiang Huang, Jian-Shun Tang, **Z. Jia**, Yi-Tao Wang, Zhi-Jin Ke, Wei Liu, Zong-Quan Zhou, Ze-Di Cheng, Jin-Shi Xu, Yu-Chun Wu, Yuan-Yuan Zhao, Guo-Yong Xiang, Chuan-Feng Li, Guang-Can Guo, Gael Sentís, and Ramon Muñoz-Tapia, Experimentally Detecting a Quantum Change Point via Bayesian Inference, *Phys. Rev. A* **98**, 040301(R) (2018)
- Bai-Chu Yu, **Z. Jia**, Yu-Chun Wu, and Guang-Can Guo, Geometric Local Hidden State Model for Some Two-qubit States, *Phys. Rev. A* **98**, 052345 (2018)
- Bai-Chu Yu, **Z. Jia**, Yu-Chun Wu, and Guang-Can Guo, Geometric Steering Criterion for Two-qubit States, *Phys. Rev. A* **97**, 012130 (2018)
- **Z. Jia**, Gao-Di Cai, Yu-Chun Wu, Guang-Can Guo, and Adán Cabello, The Exclusivity Principle Determines the Correlation Monogamy, [[arXiv:1707.03250](#)]
- **Z. Jia**, Yu-Chun Wu, and Guang-Can Guo, Characterizing nonlocal correlations via universal uncertainty relations, *Phys. Rev. A* **96**, 032122(2017)
- **Z. Jia**, Yu-Chun Wu, and Guang-Can Guo, Monogamy Relation in No-disturbance Theories, *Phys. Rev. A* **94**, 012111(2016)
- Yan Shao, Fang-Ping Ouyang, Sheng-Lin Peng, Qi Liu, **Z. Jia**, Hui Zou, First-Principles Calculations of Electronic Properties of Defective Armchair MoS<sub>2</sub> Nanoribbons, [*J. Acta Phys. -Chim. Sin.*, 2015,31 (11): 2083-2090.

## LECTURE NOTES

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- **Z. Jia**, [Lecture notes on string theory](#)
- **Z. Jia**, [Lecture notes on quantum information theory](#)