Zhu-yao Jin

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ABOUT ME

I am Zhu-yao Jin, born in Romania in 1999.02, but I am Chinese and grew up in China. I am a **theoretical** quantum physics PhD candidate, expecting to graduate in **2026.06**. My current publications **(11*PRA and 1*preprint, as the first author)** are listed blow. My research interests focus on **the control of quantum dynamics under time-dependent Hermitian and non-Hermitian Hamiltonian**, enabling **exact solutions** to the time-dependent Schrödinger equation. This framework enables a variety of applications, including **state transfer**, **entanglement generation**, **geometric gates** and **Majorana braiding**.

EDUCATION

2021.09 - 2026.06 Zhejiang university, Hangzhou, China (PhD Candidate)

- *Supervisor*: Prof. Jun Jing

2017.09 - 2021.07 Shanxi university, Taiyuan, China (BS)

AWARDS AND SCHOLARSHIPS

- 2024-2025 **National Scholarship for Doctoral Students** (top 5%)
- 2023-2024 **Funding for Excellent Doctoral Dissertation Candidates** (2 awards available in Physics)
- 2023-2024 **Huawei Scholarship**

RESEARCH INTERESTS

- **Universal quantum control theory** for controlling the dynamics of discrete- and continuous-variable systems governed by time-dependent Hermitian or non-Hermitian Hamiltonian.
- **State transfer, entanglement generation, geometric gates, and braiding operations for Majorana zero modes.**
- **Quantum blockade** (such as magnon blockade).

MAIN ACHIEVEMENTS

- **Propose the universal quantum control (UQC) theory for discrete-variable systems [Ref. (5)],** unifying the shortcuts to adiabaticity, nonadiabatic holonomic quantum transformation, Lewis-Riesenfeld theory for invariant, counterdiabatic driving method, and counterdiabatic driving in the dressed states. **Our UQC theory reveals the underlying equivalence of these control protocols.**
- **Develop the UQC theory,** including a brief recipe for UQC theory in two-band system**[Ref. (6)],** generation of GHZ state in neutral atoms with UQC theory **[Ref. (7)],** UQC theory with dynamical correction **[Ref. (8)],** and UQC theory for braiding Majorana zero modes **[Ref. (10)].**
- **Extend UQC theory to non-Hermitian discrete-variable systems [Ref. (9)],** enabling the flexible and perfect state transfer in open two- and three-level systems without normalization of quantum trajectories.

- Stabilize a single magnon state with the single-excitation probability $P_1 \sim 0.40$ and the second-order equal-time correlation function $g^{(2)}(0) \sim 10^{-5}$ **[Ref. (2,4)].**
- Propose the multi-qubit geometric controlled gates via dark-path scheme **[Ref. (3)].**

PUBLICATIONS

Preprints

(1) **Zhu-yao Jin** and Jun Jing*, Universal quantum control over non-Hermitian continuous-variable systems **arXiv:2512.04495 (2025),**

Journal Articles

(11) **Zhu-yao Jin** and Jun Jing*, Universal quantum control over bosonic networks, **Physical Review A 113, 012426 (2026).**

(10) **Zhu-yao Jin** and Jun Jing*, Universal quantum control over Majorana zero modes, **Physical Review A 112, 052614 (2025).**

(9) **Zhu-yao Jin** and Jun Jing*, Universal quantum control by non-Hermitian Hamiltonian, **Physical Review A, 112, 032605 (2025).**

(8) **Zhu-yao Jin** and Jun Jing*, Universal quantum control with dynamical correction, **Physical Review A, 112, 022427 (2025).**

(7) **Zhu-yao Jin** and Jun Jing*, Preparing Greenberger-Horne-Zeilinger states on ground levels of neutral atoms, **Physical Review A 112, 022602 (2025).**

(6) **Zhu-yao Jin** and Jun Jing*, Entangling distant systems via universal nonadiabatic passage, **Physical Review A 111, 022628 (2025).**

(5) **Zhu-yao Jin** and Jun Jing*, Universal perspective on nonadiabatic quantum control, **Physical Review A 111, 012406 (2025).**

(4) **Zhu-yao Jin** and Jun Jing*, Stabilizing a single-magnon state by optimizing magnon blockade, **Physical Review A 110, 012459 (2024).**

(3) **Zhu-yao Jin** and Jun Jing*, Geometric quantum gates via dark paths in Rydberg atoms, **Physical Review A 109, 012619 (2024).**

(2) **Zhu-yao Jin** and Jun Jing*, Magnon blockade in magnon-qubit systems, **Physical Review A 108, 053702 (2023).**

(1) **Zhu-yao Jin,** Jia-shun Yan and Jun Jing*, Measurement-induced nuclear spin polarization, **Physical Review A 106, 062605 (2022).**