

Zhide Lu

Nationality China

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EDUCATION

2019 – 2024 Ph.D. student, Center for Quantum Information, IIIS, Tsinghua University

Advisor: Prof. Dong-Ling Deng

Research direction: Quantum artificial intelligence; Quantum computation

Thesis: *Studies on Quantum Neural Networks*

2015 – 2019 B.S., University of Science and Technology Beijing

Major: Applied physics

Thesis: *Quantum neural networks and quantum many-body problems*

PUBLICATIONS

1) Deep quantum neural networks on a superconducting processor

Xiaoxuan Pan*, **Zhide Lu***, Dong-Ling Deng[†], Luyan Sun[†], et al.

Nat. Commun. 14, 4006 (2023)

2) Markovian Quantum Neuroevolution for Machine Learning

Zhide Lu^{*1}, Pei-Xin Shen*, and Dong-Ling Deng[†]

Phys. Rev. Applied 16, 044039 (2021)

3) Quantum continual learning overcoming catastrophic forgetting

Wenjie Jiang, **Zhide Lu**, and Dong-Ling Deng[†]

Chinese Phys. Lett. 39 050303 (2022)

4) Quantum neural network classifiers: A tutorial

Weikang Li[†], **Zhide Lu**, and Dong-Ling Deng[†]

SciPost Phys. Lect. Notes 61 (2022) [Code]

5) Non-Hermitian Persistent Current Transport

Pei-Xin Shen, **Zhide Lu**, Jose L Lado, Mircea Trif

arXiv:2403.09569 (2024)

^{1*} for co-first authors, and [†] for corresponding authors.

6) Adversarial learning in quantum artificial intelligence

Pei-Xin Shen, Wenjie Jiang, Weikang Li, **Zhide Lu**, and Dong-Ling Deng[†]
Acta Phys. Sin., 2021, 70: 140302 (2021) (Invited review in Chinese)

7) Expressibility-induced concentration of quantum neural tangent kernels

Li-Wei Yu[†], Weikang Li, Qi Ye, **Zhide Lu**, Zizhao Han, and Dong-Ling Deng[†]
arXiv:2311.04965 (2023)

8) Long-lived topological time-crystalline order on a quantum processor

Liang Xiang*, Wenjie Jiang*, Zehang Bao*, Zixuan Song, Shibo Xu, Ke Wang, Jiachen Chen, Feitong Jin, Xuhao Zhu, Zitian Zhu, Fanhao Shen, Ning Wang, Chuanyu Zhang, Yaozu Wu, Yiren Zou, Jiarun Zhong, Zhengyi Cui, Aosai Zhang, Ziqi Tan, Tingting Li, Yu Gao, Jinfeng Deng, Xu Zhang, Hang Dong, Pengfei Zhang, Si Jiang, Weikang Li, **Zhide Lu**, Zheng-Zhi Sun, Hekang Li, Zhen Wang, Chao Song, Qiujiang Guo, Fangli Liu, Zhe-Xuan Gong, Alexey V Gorshkov, Norman Y Yao, Thomas Iadecola, Francisco Machado, H Wang[†], Dong-Ling Deng[†]
arXiv:2401.04333 (2024)

RESEARCH INTERESTS

My research focuses on the interplay between quantum information, artificial intelligence (AI), and quantum physics. On the one hand, a range of tools and ideas from AI can be applied to solve complex quantum problems. On the other hand, quantum computing also brings unprecedented opportunities to enhance or innovate AI algorithms. My specific research directions include:

■ Quantum-Enhanced machine learning

- Designing new quantum machine learning algorithms that exhibit quantum speed-ups over their classical counterparts
- Finding machine learning problems that show unambiguous complexity separation between quantum and classical algorithms
- developing theoretical and empirical characterization of new classes of quantum machine learning models

■ Machine learning for quantum physics

- Solving quantum many-body problems, such as finding the system's ground state and simulating its dynamics
- Developing explainable, trustworthy machine learning methods
- Developing efficient methods searching for the quantum circuit architectures

CONFERENCES & TALKS

1) The 12th International Conference on Computing and Pattern Recognition (2023)

Invited talk: *Recent Progress on Deep Quantum Neural Networks*

2) APS March Meeting 2023, Virtual

Contributed talk: *Markovian Quantum Neuroevolution for Machine Learning*

3) Progress in Electromagnetics Research Symposium (Prague, Czech, 2023)

Contributed talk: *Deep Quantum Neural Networks on a Superconducting Processor*

4) The 2nd International Conference on Emerging Quantum Technology (2023)

Poster: *Deep quantum neural networks on a superconducting processor*

5) The 6-th International Conference on “Quantum Information, Spacetime, and Topological Matter” (2021)

Poster: *Markovian Quantum Neuroevolution for Machine Learning*

6) QUANTUMatter 2024 (San Sebastian · Donostia, Spain, 2024)

Poster: *Deep Quantum Neural Networks equipped with the backpropagation algorithm*

ACADEMIC SERVICES

■ Journal Referee

- Nature Communications
- Physical Review Letters
- Physical Review Applied
- Physical Review A
- Advanced Quantum Technologies
- Science China Physics, Mechanics & Astronomy
- Acta Physica Sinica

RELEVANT GRADUATE COURSES

■ Tsinghua University

Quantum Computation: Concept and Architecture, 4.0/4.0

Quantum Artificial Intelligence, 4.0/4.0

Selected Topics in Computational Quantum Physics, 3.6/4.0

AWARDS & ACHIEVEMENTS

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| 2023.10 | Friends of Tsinghua - The Toyota Scholarship |
| 2022.10 | The Scholarship of the Institute for Interdisciplinary Information Sciences |
| 2021.10 | The Scholarship of the Institute for Interdisciplinary Information Sciences |
| 2017.11 | Contemporary Undergraduate Mathematical Contest in Modeling First Prize in Beijing area |
| 2017.03 | The 8th Mathematics competition of Chinese College Students First Prize |