

# Zhide Lu

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**Nationality** China

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## EDUCATION

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

Advisor: *Prof. Dong-Ling Deng*;

Research direction: Quantum artificial intelligence; Quantum computation.

**2015 – 2019 Bachelor, University of Science and Technology Beijing**

Major: Applied physics;

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

## PUBLICATIONS

### 1). Markovian Quantum Neuroevolution for Machine Learning

**Zhide Lu**<sup>\*1</sup>, Pei-Xin Shen<sup>\*</sup>, and Dong-Ling Deng<sup>†</sup>

Phys. Rev. Applied 16, 044039 (2021)

### 2). Deep quantum neural networks on a superconducting processor

Xiaoxuan Pan<sup>\*</sup>, **Zhide Lu**<sup>\*</sup>, Dong-Ling Deng<sup>†</sup>, Luyan Sun<sup>†</sup>, et al.

Nature Communications 14, 4006 (2023)

### 3). Quantum continual learning overcoming catastrophic forgetting

Wenjie Jiang, **Zhide Lu**, and Dong-Ling Deng<sup>†</sup>

Chinese Phys. Lett. 39 050303 (2022)

### 4). Quantum neural network classifiers: A tutorial

W Li<sup>†</sup>, **Zhide Lu**, and Dong-Ling Deng<sup>†</sup>

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

### 5). Adversarial learning in quantum artificial intelligence

Pei-Xin Shen, Wenjie Jiang, Weikang Li, **Zhide Lu**, and Dong-Ling Deng<sup>†</sup>

Acta Phys. Sin., 2021, 70: 140302 (2021) (Invited review in Chinese)

### 6). Expressibility-induced concentration of quantum neural tangent kernels

Li-Wei Yu<sup>†</sup>, Weikang Li, Qi Ye, **Zhide Lu**, Zizhao Han, and Dong-Ling Deng<sup>†</sup>

arXiv:2311.04965 (2023)

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<sup>1\*</sup> for co-first authors, and <sup>†</sup> for corresponding authors.

## RESEARCH INTERESTS

My research focuses on the interplay between quantum computation and 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 offer quantum speed-ups over their classical counterparts.
  - Finding machine learning problems that show unambiguous complexity separation between quantum and classical algorithms.
- **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). 2023 12th International Conference on Computing and Pattern Recognition

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

### 2). APS March Meeting 2023, Virtual

Contributed talk: *Markovian Quantum Neuroevolution for Machine Learning*

### 3). PIERS2023 (Prague, Czech), Session “Quantum Computation and Quantum Simulation”

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*

## ACADEMIC SERVICES

- **Journal Referee**
  - Nature Communications
  - Physical Review Letters
  - 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

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