

Yang Liu

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EDUCATION

East China Normal University

M.Sc. in Condensed matter physics

Advisor: Haiyuan Zou

Shanghai, China

Sep. 2022 - Expected Jun 2025

Research Field: Strongly correlated many body systems, Tensor Networks(TNs), Quantum Phase Transition

Core Courses: Advanced Quantum Mechanics, Theory of Solids, Computational Physics, Physics of Semiconductor Devices, Modern Physics

Experiments, Advanced statistical physics, Introduction to condensed matter physics

North China University of Science and Technology

B. Sc. in Applied Physics

Tangshan, China

Sep. 2017 - Jun. 2021

Core Courses: Advanced Mathematics, Linear Algebra, Probability and Statistics, General Physics, Solid State Physics, Fundamentals of Analog Circuits,

Fundamentals of Electronic Technology, Electrical and Electronics, Digital Image Processing

PUBLICATIONS

1. **Yang Liu**, Songtai Lv, Yuchen Meng, Zefan Tan, Erhai Zhao, Haiyuan Zou, "Exact Fisher zeros and thermofield dynamics across a quantum critical point", *Phys. Rev. Research* 6, 043139 (2024).
2. **Yang Liu**, Erhai Zhao, Haiyuan Zou, "From Complexification to Self-Similarity: New Aspects of Quantum Criticality", *Chin. Phys. Lett.* 41, 100501 (2024).
3. **Yang Liu**, Songtai Lv, Yang Yang, Haiyuan Zou, "Signatures of quantum criticality in the complex inverse temperature plane", *Chin. Phys. Lett.* 40, 050502 (2023).

RESEARCH EXPERIENCE

• Tensor Network Methods:

1. Simulating Quantum States of 1D Lattice Models: Utilized Matrix Product States (MPS) to simulate quantum states of a 1D lattice model through Matlab and Python. Applied imaginary time evolution to solve for the ground state energy of the 1D Heisenberg model using the imaginary Time Evolution Block Decimation (iTEBD) algorithm.
2. Tensor Renormalization Group (TRG): Implemented the Trotter-Suzuki decomposition of the imaginary time evolution operator for the 1D Transverse Field Ising Model. Developed a 2D tensor network using Matrix Product Operators (MPOs) and employed Higher Order Tensor Renormalization Group (HOTRG) for efficient contraction.

• Fisher Zeros and Quantum Phase Transitions:

Analyzed Fisher zeros in the 1D TFIM, revealing distinct smooth curves in the complex beta plane across a quantum critical point. The results refined Suzuki's solution, providing new analytical predictions about quantum dynamics. Extended this framework to other spin models, opening avenues for studying quantum critical systems in higher dimensions.

ACADEMIC CONFERENCES

2nd Conference on "Quantum Simulation of Fundamental Physics"

Shanghai, China

Display a poster: Exact Fisher zeros and thermofield dynamics across a quantum critical point

Oct.21 2024 - Oct.23 2024

Quantum Many-Body Summer School

Chongqing, China

courses: Fermi Liquid Theory, Landau Phase Transition Theory, Scaling and Renormalization, KT Phase Transition, Quantum Phase Transition

Jul.15 2024 - Jul.21 2024

The 12th Workshop on Quantum Many-Body Computation

Xi'an, China

Display a poster: Structure of Fisher zeros for 1D Transverse Ising Model in the disorder side

Apr.12 2024 - Apr.14 2024

1st Conference on "Quantum Simulation of Fundamental Physics"

Shanghai, China

Display a poster: Signatures of quantum criticality in the complex inverse temperature plane

Nov.16 2023 - Nov.18 2023

The 11th Workshop on Quantum Many-Body Computation

Fuzhou, China

Display a poster: Signatures of quantum criticality in the complex inverse temperature plane

Mar.13 2023 - Mar.17 2023

EXTRACURRICULAR ACTIVITIES

• Teaching Assistant: Atomic Physics

- Graded assignments and exams, ensuring timely and accurate feedback for over 50 students.
- Provided one-on-one assistance, helping students overcome difficulties and enhancing their understanding of atomic physics.

• Hardware Club: Joined the hardware laboratory of the school's "Maker Space"

- Gained hands-on experience with single-chip microcomputers and C programming and applied to create practical models.

• Music Club: Joined the School Folk Music Orchestra

- Studied the bamboo flute and participated in school instrument performance competitions, performing with the orchestra.