Xiangdong Zeng

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Education

Fudan University, PhD in theoretical physics
GPA: 3.45/4 — Sep 2018 – Jan 2024

- Supervisor: Prof. Ling-Yan Hung. Research interests: topological orders and tensor networks
- Relevant courses: quantum field theory, conformal field theory, general relativity, advanced electrodynamics, astrophysics, Haskell programming, etc.
- Scholarship: Xianghui Scholarship of Fudan University, 2018

Fudan University, BSc in physics
GPA: 3.57/4 — Sep 2014 – Jun 2018

- Relevant courses: quantum mechanics, statistical physics, electrodynamics, solid state physics, quantum computation and quantum information, differential geometry, group theory, etc.
- Scholarship: Honor Student Scholarship in Natural Science, 2018

Internship experience

atelierAnchor
Intern engineer — Apr 2021 – Jan 2024

- Develop websites, assist develop and testing for typefaces, participate in the editing of self-published works

Research projects

Strange correlators and holographic tensor networks
Jun 2020 – Dec 2023

- The partition function of 2d critical lattice models can be obtained by taking inner product of the ground state wavefunctions of topological orders and the corresponding boundary product states (i.e. strange correlator). Based on this idea and the fixed-point property of topological orders, the renormalization group (RG) operators can be achieved by continuously applying the F-moves in the tensor category
- Renormalization group operators can provide the construction of holographic tensor networks, where we can calculate the bulk-boundary propagator and check whether it is consistent with prediction of AdS/CFT
- We also study the operator pushing in holographic tensor networks and give the condition that boundary operators become generalized free fields for some specific models
- Publications: Zeng *et al.* Entropy **2023**, 25(11), 1543; Chen *et al.* arXiv:2210.12127

Tensor network representations of Virasoro and Kac–Moody algebras
Jan 2022 – May 2023

- We propose a general implementation of the Virasoro and Kac–Moody algebras in generic tensor network representations of 2d critical lattice models, even when the Hamiltonian is not available
- This method is verified numerically in various systems such as Ising model, dimer model and Fibonacci anyon system
- Publications: Zeng *et al.* Phys. Rev. B **107**, 245146 (2022); Wang *et al.* Phys. Rev. B **106**, 115116 (2022)

Machine learning and Ising model
Jan 2018 – Jun 2018

- We use supervised learning methods such as linear classification models and neural networks composed of multiple linear layers to classify the phases of Ising model
- The connection between energy-based models (e.g. RBM) and renormalization group is explored; convolutional layers are also introduced in an attempt to theoretically establish the correspondence with AdS/CFT

Skills

Programming

- Programming languages: Python, C/C++, JavaScript/TypeScript, Rust, Julia, Haskell, Lua
- Scientific computing: NumPy, SciPy, Mathematica, MATLAB
- Web development: HTML/CSS, Vue.js, Vite, Nuxt, Tailwind CSS, Bootstrap
- Others: Git, Bash, Linux, LaTeX

Languages

- Mandarin Chinese (native), English (fluent), Japanese (basic)