SHI FENG

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Education

The Ohio State University (OSU) — **Columbus, Ohio, USA**
Ph.D in Theoretical Physics — *2018–Present*
- Advisor: Nandini Trivedi
- Thesis: Fractionalization and entanglement in frustrated Mott insulators

Xi'an Jiaotong University (XJTU) — **Xi'an, Shaanxi, China**
B.S. in Physics — *2014–2018*
- Honors Science Program (Physics), Qian Xuesen College
- Visiting Student in University of California, Riverside (UCR), 2016

Interest & Expertise

1: Theoretical study of quantum spin liquids and topologically ordered matter

2: Quantum magnetism and frustrated magnetism: phase transitions, spin dynamics, response theory

3: Quantum entanglement, non-equilibrium quantum dynamics and their application in condensed matter

4: Statistical models and machine learning methods relevant for condensed matter theory

5: Tensor network methods for quantum many-body systems: MPS, DMRG, TEBD, etc

Publications & Preprints

[**10**]: **S. Feng**, A. Agarwala, N. Trivedi, "Dimensional reduction of Kitaev spin liquid at quantum criticality", arXiv:2308.08116 (2023)

[**9**]: K. Zhang, **S. Feng**, Y. D. Lensky, N. Trivedi, E. Kim, "Machine learning feature discovery of spinon Fermi surface", arXiv:2306.03143 (2023)

[**8**]: **S. Feng**, D. Kong, N. Trivedi, "A statistical approach to topological entanglement: Boltzmann machine representation of higher-order irreducible correlation", arXiv:2302.03212 (2023)

[**7**]: **S. Feng**, A. Agarwala, S. Bhattacharjee, N. Trivedi, "Anyon dynamics in field-driven phases of the anisotropic Kitaev model", Phys. Rev. B 108, 035149 (2023)

[**6**]: **S. Feng**, Y. He, N. Trivedi, "Detection of long-range entanglement in gapped quantum spin liquids by local measurements", *Phys. Rev. A* 106, 042417 (2022)

[**5**]: **S. Feng**, G. Alvarez, N. Trivedi, "Gapless to gapless phase transitions in quantum spin chains", *Phys. Rev. B* 105, 014435 (2022)

[**4**]: **S. Feng**, N. D. Patel, P. Kim, J. H. Han, N. Trivedi, "Magnetic phase transitions in quantum spin-orbital liquids", *Phys. Rev. B*, 101, 155112 (2020)

[**3**]: T. Xiao, J. Wang, S. Yang, Y. Zhu, D. Li, Z. Wang, **S. Feng**, L. Bu, X. Zhan, G. Lu, "Film-depth-dependent Crystallinity for Light Transmission and Charge Transport in Semitransparent Organic Solar Cells", *Journal of Materials Chemistry*, A, 2020, 8, 401 (2020)

[**2**]: D. Li, S. Li, W. Lu, **S. Feng**, P. Wei, Y. Hu, X. Wang, G. Lu, "Rapidly measuring charge carrier mobility of organic semiconductor films upon a point-contact four-probes Method", *IEEE J-EDS* 2018.2872714 (2018)

[**1**]: L. Bu, S. Gao, W. Wang, L. Zhou, **S. Feng**, X. Chen, D. Yu, S. Li, G. Lu, "Film-depth-dependent light absorption and charge transport for polymer electronics", *Adv. Electron. Mater*, 2:1600359 (2016)

In preparation:

[**2**]: **S. Feng**, "Kinetic constraint in perturbed Z_2 topological matter"

[**1**]: **S. Feng**, X. Yang, N. Trivedi, "Non-linear pump-probe response of composite gauge fermions of Z_2 topological order"

Research Experiences

OSU **Columbus, OH, USA**
Graduate Research Assistant *2020–Present*
Advisor: Nandini Trivedi (Department of Physics, OSU)
- Quantum spin liquid: Kitaev model, response, entanglement and topological order.
- Statistical methods and machine learning approach to quantum many-body physics
- Magnetic phase transitions in one dimensional quantum spin (orbital) systems

XJTU **Xi'an, Shaanxi, China**
Undergraduate Research Assistant *2017 - 2018*
Advisor: Guanghao Lu (Frontier Institute of Science and Technology, XJTU)
- Absorption and charge transport in semiconductor/insulator polymers
- In-situ reconstruction of tomography of nanowires buried in conjugated polymers

UCLA **Los Angeles, CA, USA**
Cross-disciplinary Scholars in Science and Technology *Summer 2017*
Advisor: Hongwen Jiang (Department of Physics and Astronomy, UCLA)
- Electron beam induced defects in SiO_2 using Monte Carlo simulation; Fabrication of MOS quantum dots by nano-imprint lithography that mitigates E-beam induced defects

UCR **Riverside, CA, USA**
Undergraduate Research Assistant *Fall 2016*
Advisor: Marc Bockrath (Department of Physics, UCR)
- Nano fabrication and the analysis of electronic transport in twisted bilayer graphene

Academic Activities

Jul, 2023: **Boulder Summer School – Non-Equilibrium Quantum Dynamics**, Boulder, Colorado, USA
- Poster: Anyon response in field-induced quantum spin liquids

May, 2023: **TopoMag23 – Topology and Fractionalization in Magnetic Materials**, Columbus, Ohio, USA
- Poster: Anyon response in field-induced quantum spin liquids
- Lecture: Frustrated magnetism and quantum spin liquid

Apr, 2023: **Topology, Symmetry and Interactions in Crystals**, KITP-UCSB, California, USA
- Poster: Dynamics of Abelian anyons in the Kitaev model

Mar, 2023: **APS March Meeting**, American Physical Society
- Contributed Talk: Transition from Kitaev quantum spin liquid to weakly coupled critical spin chains

Feb, 2023: **Edward F. Hayes Advanced Research Forum**, OSU, Ohio, USA
- Contributed Talk: Anyon, fractionalization, and their detection

Jun, 2022: **Gordon Research Conference: Strongly Correlated Systems**, Mt. Holyoke College, MA, USA
- Poster: Discovery of novel topological phase in Kitaev spin liquid in a field

Mar, 2022: **APS March Meeting**, American Physical Society
- Contributed Talk: Spin response and magnetic absorption of Kitaev liquids under an external field.

Mar, 2021: **APS March Meeting**, American Physical Society
- Contributed Talk: Field-induced gapless-to-gapless phase transitions in integer spin chains.

Aug, 2020: **Ultra Quantum Matter**, Perimeter Institute for Theoretical Physics, Waterloo, Canada

Jun, 2020: **Condensed Matter Physics in all Cities**, University of Kent Canterbury, Kent, UK
- Contributed Talk: Magnetic phase transition in quantum spin orbital liquid.

Honors and Awards

2023: **Presidential Fellowship**, *OSU*, Columbus, OH, USA
- The Presidential Fellowship is the most prestigious award given by the Graduate School of OSU, embodying the highest standards of scholarship in the full range of Ohio State's graduate programs

2023: **2nd place, Edward F. Hayes Advanced Research Forum**, *OSU*, Columbus, OH, USA

2018: **Siyuan Scholarship**, *XJTU*, Xi'an, Shaanxi, China

- Awarded to undergraduate students for their academic excellence

2017: **CSST Scholarship**, *UCLA*, Los Angeles, CA, USA

- Awarded in the UCLA-CSST program for cross-disciplinary scholars in science and technology

2016: **Meritorious Winner** of Interdisciplinary Contest in Modelling, Bedford, MA, USA

2016: **1st Place Award** of China Mathematical Contest in Modelling, Xi'an, Shaanxi, China

2013: **2nd Place Award** of Chinese Physics Olympiad, Xi'an, Shaanxi, China

Teaching Experiences

Center for Emergent Material, OSU **Columbus, OH, USA**
Lecturer, TopoMag23 Crash Course *May 2023*

- Crash course on frustrated magnetism and quantum spin liquid

Department of Physics, OSU **Columbus, OH, USA**
Graduate Teaching Assistant *2018-2021*

- Statistical Mechanics (Fall 2021, OSU)
- Introductory Physics – Electromagnetism, Optics, Modern Physics (Spring 2020, OSU)
- Introductory Physics – Mechanics, Thermal Physics, Waves (Fall 2019, OSU)
- Introductory Physics – Mechanics, Kinematics, Fluids, Waves (Spring 2019, OSU)
- Statistical Mechanics (Fall 2018, OSU)

Technical Skills

Projects: Developer and maintainer of

- ExactDiagPy: Exact diagonalization for a generic many body Hamiltonian in Python
- 2DMonteCarlo: Real time visualization tool for Monte Carlo simulation using OpenGL in C++

Programming Languages: C++, Python, Julia, Perl, Matlab, Mathematica, Java, Bash

Libraries and Softwares:

- Libraries: Eigen, TenPy, DMRG++, ITensor, HDF5, OpenGL, Blas, Lapack
- Softwares: Blender, Inkscape

OS and Clusters:

- OS: Linux (Ubuntu), Windows, macOS, High Performance Computing (HPC) environments
- Clusters: Unity and Ohio Supercomputer Center (OSC)

References

Nandini Trivedi
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The Ohio State University
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Professor, Physics
International Centre for Theoretical Sciences, Bengaluru, India
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