

SHI FENG

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Education

The Ohio State University (OSU)

Ph.D in Condensed Matter Theory

- Advisor: Nandini Trivedi
- Thesis: Topological order in frustrated systems

Xi'an Jiaotong University (XJTU)

B.S. in Physics

- Honors Science Program (Physics), Qian Xuesen College
- Visiting Student in University of California, Riverside (UCR), 2016

Columbus, Ohio, USA

2018–2024 (*expected*)

Xi'an, Shaanxi, China

2014–2018

Interest & Expertise

1. Theoretical study of quantum spin liquids and topologically ordered matter
2. Quantum magnetism and frustrated systems: phase transitions, dynamics, and response theory
3. Quantum entanglement, non-equilibrium quantum dynamics and their application in condensed matter
4. Tensor network methods for many-body systems: MPS, DMRG, TEBD, etc
5. Statistical models and machine learning methods relevant for condensed matter theory

Publications & Preprints

1. *Hidden subsystem symmetry protected states in competing topological orders*
S. Feng
[arXiv:2309.02307](https://arxiv.org/abs/2309.02307) (2023)
2. *Dimensional reduction of Kitaev spin liquid at quantum criticality* *
S. Feng, A. Agarwala, N. Trivedi
[arXiv:2308.08116](https://arxiv.org/abs/2308.08116) (2023)
3. *Machine learning feature discovery of spinon Fermi surface*
K. Zhang, **S. Feng**, Y. D. Lensky, N. Trivedi, E. A. Kim
[arXiv:2306.03143](https://arxiv.org/abs/2306.03143) (2023)
4. *A statistical approach to topological entanglement: Boltzmann machine representation of higher-order correlation*
S. Feng, D. Kong, N. Trivedi
[arXiv:2302.03212](https://arxiv.org/abs/2302.03212) (2023)
5. *Anyon dynamics in field-driven phases of the anisotropic Kitaev model* *
S. Feng, A. Agarwala, S. Bhattacharjee, N. Trivedi
Phys. Rev. B **108**, 035149 (2023)
6. *Detection of long-range entanglement in gapped quantum spin liquids by local measurements*
S. Feng, Y. He, N. Trivedi
Phys. Rev. A **106**, 042417 (2022)
7. *Gapless to gapless phase transitions in quantum spin chains*
S. Feng, G. Alvarez, N. Trivedi
Phys. Rev. B **105**, 014435 (2022)
8. *Magnetic phase transitions in quantum spin-orbital liquids*
S. Feng, N. D. Patel, P. Kim, J. H. Han, N. Trivedi
Phys. Rev. B **101**, 155112 (2020)
9. *Film-depth-dependent Crystallinity for Light Transmission and Charge Transport in Semitransparent Organic Solar Cells*
T. Xiao, J. Wang, S. Yang, Y. Zhu, D. Li, Z. Wang, **S. Feng**, L. Bu, X. Zhan, G. Lu

[Journal of Materials Chemistry, A, 2020, 8, 401 \(2020\)](#)

10. *Rapidly measuring charge carrier mobility of organic semiconductor films upon a point-contact four-probes Method*
D. Li, S. Li, W. Lu, **S. Feng**, P. Wei, Y. Hu, X. Wang, G. Lu
[IEEE J-EDS 2018.2872714 \(2018\)](#)
11. *Film-depth-dependent light absorption and charge transport for polymer electronics: A Case Study on Semiconductor/Insulator Blends by Plasma Etching*
L. Bu, S. Gao, W. Wang, L. Zhou, **S. Feng**, X. Chen, D. Yu, S. Li, G. Lu
[Adv. Electron. Mater 2:1600359 \(2016\)](#)

Works in preparation:

1. **S. Feng**, X. Yang, N. Trivedi. Non-linear pump-probe response of anyons
2. **S. Feng**, N. Trivedi. Probing topological states by high-order mutual information

Research Experiences

OSU

Columbus, OH, USA

Graduate Research Assistant

2018–Present

Advisor: Nandini Trivedi (Department of Physics, OSU)

- Theory of topological order: quantum spin liquid and Kitaev honeycomb model; detection of fractionalization; linear and non-linear response of fractionalized particles; projected symmetry group.
- Quantum information: (topological) quantum entanglement, stabilizer code, cluster state, lattice gauge theory.
- Magnetism: quantum phase transitions and fractionalization in one dimensional frustrated systems
- Numerical methods: Exact diagonalization, matrix product states, density matrix renormalization group, time-evolving block decimation
- Statistical methods and machine learning approach to quantum many-body physics: Restricted Boltzmann machine, convolution neural network

XJTU

Xi'an, Shaanxi, China

Undergraduate Research Assistant

2017 - 2018

Advisor: Guanghao Lu (Frontier Institute of Science and Technology, XJTU)

- Transfer matrix method for light absorption in semiconductor and the in-situ reconstruction of nano-tomography

UCLA

Los Angeles, CA, USA

Cross-disciplinary Scholars in Science and Technology

2017

Advisor: Hongwen Jiang (Department of Physics and Astronomy, UCLA)

- Monte Carlo simulation of electron beam induced defects in SiO₂ and nano-imprint lithography of quantum dots

UCR

Riverside, CA, USA

Undergraduate Research Assistant

2016

Advisor: Marc Bockrath (Department of Physics, UCR)

- Nano fabrication and the analysis of electronic transport in twisted bilayer graphene

Academic Activities

Oct, 2023: Q-PHORIA, Pittsburgh Quantum Institute, Pittsburgh, PA, USA

- Poster: Dimensional reduction of quantum spin liquids

Jul, 2023: Boulder Summer School – Non-Equilibrium Quantum Dynamics, CU Boulder, CO, 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
- Invited 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

Teaching Experiences

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| Department of Physics, OSU | Columbus, OH, USA |
| <i>Graduate Teaching Assistant</i> | <i>2018-2021</i> |
- 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 with implementation of various quantum entanglement measures
- Programming Languages:** Python, Julia, C++, Perl, Matlab, Mathematica, Java, Bash
- Libraries and Softwares:**
- Eigen, TenPy, DMRG++, ITensor, HDF5, OpenGL, Blas, Lapack; Blender, Inkscape
- OS and Clusters:**
- OS: Linux (Ubuntu), Windows, macOS, High Performance Computing (HPC) environments
 - Clusters: Unity and Ohio Supercomputer Center (OSC)

References

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| Nandini Trivedi
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The Ohio State University
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Professor, Physics
ICTS, Tata Institute, India
subhro@icts.res.in | Eun-Ah Kim
Professor, Physics,
Cornell University
ek436@cornell.edu |
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