Jeet Shah

College Park, MD 20742 • jeet@umd.edu • (240) 828-9233 • LinkedIn • Google Scholar • Website

Education

University of Maryland College Park, MD
Doctoral Candidate in Physics GPA: 4.0/4.0. Jan 2021 – Dec 2025
Research Interests: Quantum Computation and Condensed Matter Theory
Advisors: Prof. Alexey Gorshkov and Prof. Victor Galitski
Selected Coursework: Quantum Error Correction | Quantum Algorithms | Machine Learning for Physicists | Many-body physics

Indian Institute of Science Bangalore, India
Bachelor of Science (Research) in Physics. GPA: 9.7/10.0 Aug 2016 – Jun 2020
Selected Coursework: Condensed Matter Physics 1 & 2 | Algorithms & Programming | Quantum Statistical Field Theory | Computational Physics | Quantum Mechanics 1 & 2

Skills

Programming Languages: Python, Julia, Mathematica, C++, Git, 3+ years experience with computing clusters
Libraries: Qiskit, Pennylane, stim, ITensors, TenPy

Research Experience

University of Maryland College Park, MD
Research Assistant Jun 2021 – Present

- Simulated open quantum system dynamics using a quantum circuit in **Qiskit**, demonstrating novel strong-to-weak spontaneous symmetry breaking.
- Designed a concrete model exhibiting strong-to-weak spontaneous symmetry breaking; computed the steady-state phase diagram through large-scale **tensor network calculations** with **ITensors** and **Clifford circuit simulations** using `stim` library on high-performance computing clusters.
- Proposed **quantum simulation** of an exotic 3D quantum spin liquid using **Rydberg atom arrays**, extending beyond all previous 2D proposals; developed experimentally feasible protocols for measuring phase-identifying correlators; determined the phase diagram for a system of over 2,000 qubits using a combination of analytical and numerical methods.
- Performed high-precision **Monte Carlo simulations** on computing clusters to compute ground-state properties of dimer models on various lattices.
  - Engineered an exactly solvable Hamiltonian on a quasicrystal, and demonstrated that the associated gauge theory with matter is in the confined phase.
  - Efficiently simulated systems with up to 14,000 qubits on a periodic lattice; and rigorously proved for the first time that the ground-state quantum phase can depend on boundary shape.
- Introduced a new renormalization group framework for loop-based **gauge theories**, providing a completely new perspective on the transition in the compact $U(1)$ gauge theory.

Teaching Assistant Jan 2021 – May 2021

- Assisted in teaching and grading for a general physics course.

Indian Institute of Science Bangalore, India
Project Assistant Sep 2020 – Dec 2020

- Simulated dynamics of strongly correlated spin systems through Trotterized evolution and executed implementations on **IBM quantum hardware** using Qiskit.

Technical University of Munich Munich, Germany
Summer Intern May 2019 – Aug 2019

- Employed **tensor network methods** to study the gauged Kitaev chain, revealing novel fermionic symmetry protected topological order.

Research Projects

1. Breakdown of the thermodynamic limit in quantum spin and dimer models [arXiv:2506.15769].
2. A quantum monomer-dimer model on Penrose tilings [arXiv:2503.15588].
3. Quantum spin ice in three-dimensional Rydberg atom arrays [Phys. Rev. X **15**, 011025 (2025)].
4. Instability of steady-state mixed symmetry-protected topological order to strong-to-weak spontaneous symmetry breaking [arXiv:2410.12900].
5. Renormalization Group scheme for field theories on loops [Manuscript in preparation].
6. Employed tensor network methods to determine ground state properties of a gauge theory in a topological phase using the TenPy library in Python. Work led to a publication [SciPost Phys. **10**, 148 (2021)].
7. Renormalization group study of systems with quadratic band touching [Phys. Rev. B **103**, 195118].