Dr. Ahmed Ali Akhtar

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Citizenship: USA

Research interests	Quantum entanglement, disorder, noise, information, and topological phases.

Education

UC San Diego　　　　　　　　　　　　　　　　　La Jolla, CA
PhD in Physics　　　　　　　　　　　　　　　Sept 2017 – Sept 2023
Advisor: Professor Yi-Zhuang You *GPA: 3.942.*

Princeton University　　　　　　　　　　　　　Princeton, NJ
B.A. in Physics, Applications of Computing　　　Sept 2013 – June 2017
Mentors: Professors Romalis, Regnault, and Sondhi. *GPA: 3.772.*

Prior Research

Max Planck Institute for Quantum Optics
Mentor: Dr. Mari Carmen Banuls　　　　　　June 2016 – August 2016
Researched and implemented tensor network methods for quantum many-body simulation: matrix product states, entanglement, time evolution, etc.

Honors & scholarships

Physics Summer Research Fellowship, SHORE Program, Allen G. Shenstone Prize in Physics (x3), Joe Henry Summer Undergraduate Award, Edward DeWitt Shumway Jr. Scholarship, Fred Fox Award, Samuel Bayard Dod Scholarship, John Stuart Memorial Scholarship

Teaching experience

Teaching assistant, Department of Physics (UCSD)　　Fall 2017-2023
Phys 1A, 1B, 1C, 2A, 2B, 4E, 100A, 130C, 211, etc.
Graded assignments, lectured on class topics, lead discussions, prepared course materials, proctored and administered exams, held office hours, provided tutoring, mentored young scientists, etc.

Talks and trainings

NISQ Systems: Advances and Applications　　　　　Goleta, CA
Kavli Institute for Theoretical Physics　　　　　　September 2022
Attended conference to discuss and explore connections between many-body quantum dynamics, quantum complexity theory, and the use and validation of noisy, intermediate-scale quantum (NISQ) devices.

Ultra Quantum Matter Annual Meeting　　　　New York City, NY
Simons Foundation　　　　　　　　　　　　　　January 2020
Attended conference to discuss the cutting-edge in strongly interacting quantum systems, topological quantum field theories and fractonic phases of matter.

Quantum Many Body Systems far from Equilibrium　Chamonix, France

Les Houches Summer School   Summer 2019

Attended four-week long summer school about quantum systems far from equilibrium and learned different numerical and analytical techniques for treating disordered quantum systems.

APS March Meeting   2021, 2022

2022: Presented work on a scalable and efficient formulation of classical shadow tomography on finite-depth quantum circuits. 2021: Presented work on efficient descriptions and simulations of locally-scrambled purity dynamics.

Skills

Numerical: Proficient in Python. Familiar with C++, MATLAB, Mathematica, Java, HTML, and CSS. Some experience in machine learning. Experience in a variety of many-body numerical techniques such as DMRG, TEBD, VUMPS, Monte Carlo, Classical Shadow Tomography, etc. **Coursework:** Thorough education in computer science and mathematics, graduate coursework in advanced quantum mechanics, quantum field theory, re-normalization group, topological phases of matter, quantum information theory, solid state physics, and condensed matter.

References

Professor Yi-Zhuang You, Associate Professor of Physics, UCSD. **Professor Tarun Grover**, Associate Professor of Physics, UCSD. **Professor John McGreevy**, Professor of Physics, UCSD. **Dr. Namit Anand**, Staff Scientist, NASA Quantum AI Lab (QuAIL). **Dr. Jeff Marshall**, Staff Scientist, NASA Quantum AI Lab (QuAIL).

Publications

Dual-Unitary Classical Shadow Tomography. A. A. Akhtar, Namit Anand, Jeffrey Marshall, Yi-Zhuang You. *Under review, 2024.*

Measurement-induced criticality is tomographically optimal. A. A. Akhtar, Hong-Ye Hu, Yi-Zhuang You. *PRB, 2024.*

Scalable and Flexible Classical Shadow Tomography with Tensor Networks. A. A. Akhtar, Hong-Ye Hu, Yi-Zhuang You. *Quantum, 2023.*

Multiregion entanglement in locally scrambled quantum dynamics. A. A. Akhtar and Yi-Zhuang You. *PRB, 2020.*

Markovian entanglement dynamics under locally scrambled quantum evolution. Wei-Ting Kuo, A. A. Akhtar, Daniel P. Arovas, Yi-Zhuang You. *PRB, 2020.*

Symmetry breaking and localization in a random Schwinger model with commensuration. A. A. Akhtar, Rahul M. Nandkishore, S. L. Sondhi. *PRB, 2018.*