

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.*

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

Selected Publications

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.

Dual-Unitary Classical Shadow Tomography

A. A. Akhtar, Namit Anand, Jeffrey Marshall, Yi-Zhuang You
Under review, 2024.

Prior Research

Max Planck Institute for Quantum Optics

Mentor: Dr. Mari Carmen Banuls

June 2016 – August 2016

Learned and researched tensor network methods in quantum many-body simulation under Dr. Mari Carmen. Wrote classes in Python for matrix product states and operators to efficiently calculate entropies and energies and compute real and imaginary time evolution on states and density operators on 1D quantum systems

Teaching experience

Teaching assistant, Department of Physics (UCSD)

Fall 2017-Present

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.

Tutor (Princeton Tutoring)

August 2015-2017

Tutored high school students and elementary school students one-on-one in various levels of math, physics, and computer science

Relevant training

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.

Talks and tutorials

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

Programming: 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.