Shah Saad Alam |

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Education

Rice University, TX
Ph.D Physics   *2017 – 2022*
Thesis: *Quantum Spinor Gases: Universal Relations, Strong Interactions and Machine Learning Investigations*

Rice University, TX
M.S. Physics   *2015 – 2016*
Theoretical and Computational Space Plasma

Amherst College, MA
Bachelors in Physics (Honors) and Mathematics   *2010 – 2014*
Physics Honors Thesis:*"High Resolution Spectroscopy of TlF"*

JILA, Boulder
CU Boulder Summer School in Ultracold Physics   *2021*
CU Boulder Ultracold Physics summer school for AMO and Condensed Matter

Skills

Programming: Python, C++, Modern C++, Rust, Programming Languages InterOp and FFI, Fortran, MATLAB, Mathematica, Java, Pytorch, Cirq, Tensorflow, SciPy, NetworkX, Anaconda, Git, Linux, High Performance Computing

Soft Skills: Mentorship, Project Management, Leading Collaborations, Public Speaking

Work Experience

Postdoctoral Research Associate   **Jan 2023 –**
JILA, University of Colorado, Boulder, CO, Holland Group
Quantum Computing, Reinforcement Learning (RL), Physics Informed Machine Learning
○ Trained reinforcement learning models (DQNN) using Pytorch and Libtorch for optimizing design of quantum inertial sensors for future space deployment
○ Designed Physics informed reinforcement learning models
○ Wrote physics simulations of noisy quantum circuits and devices in Rust, Python and C++
○ Wrote interoperability between Rust and C++ RL code
○ Derived Bayesian statistical theory and information theory results
○ Wrote quantum circuit code in Google Cirq for optimization using reinforcement learning
○ Worked with experimentalists to simulate and optimize design of real hardware implementations
○ Collaborated with scientists in academic and industry partners (Cleveland State, CU Boulder, Infleqtion)
○ Gave scientific talks on research and wrote scientific publications

Graduate Research Assistant   **2017 – 2022**
Rice University, TX
Convolutional Neural Networks and Variational Quantum Monte Carlo
○ Collaborated with ML researchers to design physics informed interpretable convolutional neural networks (TensorFlow)
○ Project managed a multi-institution collaboration by defining project outlines, goals and timelines
○ Analytically connected Convolutional Neural Networks and information theory to quantum qubit problems
○ Supervised junior physics and computer science students
○ Analytically solved quantum qubit problems
○ Gained familiarity with domain specific quantum algorithms and general matrix algorithms

Graduate Research Assistant   2015 – 2016, 2018-2022

Rice University, TX
Space Weather and Plasma Modelling, Data Analysis and Theory

○ Wrote scripts in C++, Mathematica, MATLAB and Python codes to automate analysis of 25GB of data from Los Alamos National Lab's Van Allen Space Probes mission
○ Derived mathematical theory for data drive physics simulation of space weather in the Earth's radiation belts
○ Modified and ran space weather simulations on HPC cluster at Rice University using Rice's Radbelt Model
○ Contributed code to a collaborative multi-institution codebase and simulation effort

Graduate Research Assistant   2015 – 2016, 2018-2022

Rice University, TX
Theoretical and Computational Study of Quantum Systems

○ Wrote Python code and supervised three undergraduate projects to develop physics simulations (Python and Mathematica) and theory
○ Derived analytical theories for quantum systems and their thermodynamics
○ Analytically proved existence of unique phenomena in 1D quantum spin gases
○ Gave talks on research at multiple conferences (APS March, DAMOP)
○ Published one paper, writing another paper for publication
○ Supervised undergraduate theses
○ Developed algorithms and codes utilizing random matrix theory methods to solve quantum scattering problems
○ Coauthored two papers on results from project

Teaching and Research Assistant   2014-2015

Habib University, Pakistan

○ Taught an "Introduction to Matlab" course for freshmen engineering students
○ Wrote Matlab demonstrations of physics concepts for freshmen students

Professional Service

○ Proposed and Chaired a DAMOP conference session on Quantum Theory and Machine Learning
○ Worked with APS leadership to help start an APS chapter at Rice University
○ Served as postdoctoral rep on JILA Fellow meetings

Publications

For a full record of publications and conference talks, see Google Scholar Profile. Selected publications in prep or undergoing submission:

○ "Interpreting convolutional neural networks' low dimensional approximation to quantum spin systems", Yilong Ju, **Shah Saad Alam** (Equal Contribution), Jonathan Minoff, Fabio Anselmi, Han Pu, Ankit Patel, arxiv::2210.00692 (Currently submitting)
○ "Decorrelated, Robust Approach to Multi-Parameter Quantum Sensing" **Shah Saad Alam et al.** (currently in prep, joint collaboration with Infleqtion)

Leadership and DEI Advocacy Experience

2020-2022: Rice University Physics Department DEI committee

2019 – 2020: Director for International Student Outreach, Rice Graduate Student Association

References

○ Murray Holland, Professor of Physics and JILA Fellow, CU Boulder, Murray.Holland@colorado.edu
○ Han Pu, Professor of Physics and Astronomy, Rice University, hpu@rice.edu
○ Kaden Hazzard, Professor of Physics and Astronomy, Rice University, kaden.hazzard@gmail.com
○ Ankit B. Patel, Professor of ECE, Rice University, abp4@rice.edu