Faisal Alam

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Education

University of Illinois at Urbana-Champaign — 2019 – Present
PhD in Physics

- Thesis: Simulating quantum mechanics on quantum computers
- Advisor: Bryan K. Clark

Franklin & Marshall College — 2015 – 2019
Bachelor in Physics and Mathematics

- Thesis: Corrections to positronium energy levels using NRQED and the method of regions
- Advisor: Gregory S. Adkins

Research interests

- Compilation of quantum algorithms to hardware.

- Classical simulation of noiseless and noisy quantum computation.

- Quantum algorithms for time evolution and state preparation.

Selected publications

Efficient tomography of sparse Pauli-Lindblad channels — 2025
Daniel Belkin, **FA**, Matthew Thibodeau, Kristan Temme, Ewout Ven den berg, Alireza Seif, Bryan K. Clark (in preparation, presented at IIDAI-25)

Random matrix product states are pseudoentangled — 2025
FA, Shivan Mittal, Marco Cerezo, Lukasz Cincio (in preparation, presented at SQuInT-24)

Transmon qutrit-based simulation of spin-1 AKLT systems — 2024
Keerthi Kumaran, **FA**, Norhan Eassa, Kaelyn Ferris, Xiao Xiao, Lukasz Cincio, Nicholas Bronn, Arnab Banerjee

Learning dynamic quantum circuits for efficient state preparation — 2024
FA, Bryan K. Clark

Multi-reference quantum Davidson algorithm for quantum dynamics — 2024
Noah Berthusen, **FA**, Yu Zhang

Coulomb expectation values in $D = 3$ and $D = 3 - 2\epsilon$ dimensions — 2020
Gregory Adkins, **FA**, Conor Larison, Ruosi Sun

Experience

Graduate research assistant — 2024–present
Los Alamos National Laboratory

Quantum Computing Summer School Fellow — 2023
Los Alamos National Laboratory

Quantum Error Correction Summer School Fellow — 2022
IBM Quantum

Skills

Programming languages
Python, Julia, Mathematica, C++

Programming tools
Slurm, Qiskit, ITensors.jl, PyTorch, JAX

Quantum hardware
Superconducting qubits, trapped ion qubits

Scientific software projects

ncon-torch
Developed a PyTorch-based tensor network contraction library with GPU acceleration and autograd support

Qaravan
Developed a Python package implementing a range of techniques for classical simulation of noiseless and noisy quantum computation (tensor networks, doped matchgates, doped Clifford, Pauli propagation), with GPU-accelerated backends.

StatePrep.jl
Developed a Julia library for finding state preparation circuits with and without measurement and feedforward, scaled up using tensor networks.

Conference presentations

Random matrix product states are pseudoentangled
SQuInT 2024

Learning dynamic quantum circuits for efficient state preparation
APS March Meeting 2024

Variational algorithms for quantum dynamics with short depth quantum circuits
APS March Meeting 2023

Finding excited states on a quantum computer using unitary block optimization with VQE
APS March Meeting 2022

Professional service

- Referee for Quantum and Physical Review Letters

- Program Committee for Quantum Machine Learning track of IEEE Quantum Week 2025

References

Bryan K. Clark
University of Illinois at Urbana-Champaign

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Los Alamos National Laboratory

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University of Illinois at Urbana-Champaign

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