

Areeq Hasan

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EDUCATION

Stanford University

Doctor of Philosophy – PhD, Applied Physics

Sep. 2024 – Present

Stanford, CA

Princeton University

Bachelor of Science & Engineering – BSE, Electrical & Computer Engineering

Sep. 2020 – May 2024

Princeton, NJ

- **Concentration:** Quantum Information and Applied Physics
- **Certificate:** Program in Engineering Physics

RESEARCH INTERESTS

Quantum information, quantum simulation, atomic physics, condensed matter physics, quantum computing

EXPERIENCE

Graduate Research Assistant

Stanford University (Choi Lab)

July 2024 – Present

Stanford, CA

- Developing atomic polarizability calculations and cooling simulations for a ytterbium tweezer array.

Research Intern

Princeton University (Bakr Lab)

May 2023 – Present

Princeton, NJ

- Explored quantum simulation of the Hubbard model with ultracold fermions trapped in an optical lattice.
- Researched the physics and optical realizations of different lattice geometries from flat band physics in a Lieb lattice engineered with a punch-out potential to topological band physics in a periodically driven triangular lattice.
- Working on experimentally probing the binding energy of magnetic polarons in a kinetically frustrated Hubbard system using two-photon Raman spectroscopy of a hole-doped spin-polarized ultracold gas of fermionic lithium trapped in a triangular optical lattice building on previous work directly imaging magnetic polarons with three-point hole and spin correlations. → [Thesis](#).

Research Intern

Princeton University (Thompson Lab)

Oct. 2022 – May 2023

Princeton, NJ

- Worked on laser stability and atom detection in neutral atom quantum computing experiments.
- Developed software for detecting atoms with a camera for measurement.
- Built a scanning transfer photonic-crystal fiber Mach-Zehnder interferometer lock for stability transfer between lasers.

Quantum Engineer Summer Intern (Systems)

IBM Quantum (Prototypes Team @ Algorithms & Applications Research)

May 2022 – Aug. 2022

Yorktown Heights, NY

- Developed multi-qubit encodings for a quantum combinatorial optimization algorithm, concurrent estimation of ground state energies across multiple quantum processors, and nonlinear extrapolation strategies for a quantum error mitigation technique.

Summer Research Intern

Harvard University (Xu Lab)

Jul. 2021 – Aug. 2021

Cambridge, MA

- Gained experience fabricating and characterizing two-dimensional quantum materials.

Summer Research Intern

Princeton University (Hasan Lab)

Jun. 2021 – Jul. 2021

Princeton, NJ

- Developed queries for crystallographic databases searching for materials hosting Lieb lattice structures and analyzed band structures searching for favorable electronic and spin properties.

Summer Research Intern

California Institute of Technology (Hsieh Lab)

Aug. 2019 – Sep. 2019

Pasadena, CA

- Gained tabletop experience working with optics and related instrumentation for nonlinear ultrafast optical spectroscopy of quantum materials.

Summer Research Intern

Princeton University (Hasan Lab)

Jun. 2018 – Aug. 2018

Princeton, NJ

- Prepared samples and operated a scanning tunneling microscope at low temperatures under UHV conditions to acquire atomic resolution scans of the spin-orbit superconductor PbTaSe₂ as a potential candidate hosting Majorana zero modes and a potential platform for developing topological qubits

COURSEWORK

Electrical & Computer Engineering: Electronic Circuit Design, Contemporary Logic Design, Information Signals, Introduction to Quantum Computing, Robotic and Autonomous Systems Lab, Quantum Optics, Quantum Information and Entanglement, Implementations of Quantum Information

Physics: Advanced Physics (Mechanics), Advanced Physics (Electromagnetism), Classical Mechanics, Principles of Quantum Mechanics, Thermal Physics, Introduction to Quantum Theory, Advanced Quantum Mechanics, Introduction to Condensed Matter Physics

Math: Multivariable Calculus, Advanced Linear Algebra with Applications, Algebra I, Numerical Analysis & Scientific Computing

Computer Science: Algorithms and Data Structures, Introduction to Programming Systems, Theory of Algorithms