Hyeongjin Kim

PhD Student · Condensed Matter Theory · Computational Physics

hkim12@bu.edu | hyeongjinkim.com | hjkqubit

Education

Boston University *Boston, MA*

Ph.D. in Physics *2021 - present*

Advisor: Anatoli Polkovnikov

Williams College *Williamstown, MA*

B.A. in Physics *2017 - 2021*

Advisor: Frederick Strauch
Thesis: *Optimal Control and Circuit Synthesis of Quantum Gates*
Academic Honor Societies: Phi Beta Kappa, Sigma Xi

Publications

Hyeongjin Kim, Matthew T. Fishman, and Dries Sels. (2024). Variational Adiabatic Transport of Tensor Networks. PRX Quantum **5**, 020361. *PDF*

Hyeongjin Kim and Anatoli Polkovnikov. (2024). Integrability as an attractor of adiabatic flows. Phys. Rev. B **109**, 195162. (**Editors' Suggestion**) *PDF*

Research Experience

Research Fellow – Boston University *Boston, MA*

Advisor: Anatoli Polkovnikov *2022-present*

- Researching the classical-quantum correspondence of chaos and energy density in many-body systems.
- Working on understanding the time scales associated with chaos (Lyapunov, prethermalization, and thermalization times) in classical many-body spin systems.
- Investigated the geometry of quantum integrability and chaos of many-body systems in an adiabatic landscape determined by the quantum geometric tensor.

Summer Research Associate – CCQ, Flatiron Institute, Simons Foundation *New York, NY*

Advisors: Matthew Fishman, Dries Sels *2022*

- Developed a novel tensor network method to propagate eigenstates of many-body Hamiltonian systems over the parameter space via the adiabatic gauge potential. The software is publicly available as a Github repository in ITensorAGP.jl.

Research Assistant – Department of Physics, Williams College *Williamstown, MA*

Advisor: Frederick Strauch *2019-2021*

- Analytically developed and numerically optimized gate pulses for fast, high-fidelity gates in quantum computers.

Research Assistant – Department of Physics, Williams College *Williamstown, MA*

Advisor: Katharine Jensen *2018*

- Investigated the mechanics of adhesive contacts of rigid glass spheres with silicone gel surfaces of varying Young's modulus.

Invited Talks

Center for Computational Quantum Physics, Simons Foundation *New York, NY*
Adiabatic evolution of matrix product states with the adiabatic gauge potential *April 2023*

Department of Physics, New York University *New York, NY*
Computing Excited States via Adiabatic Transformations *March 2023*

Talks

March 2024. *Connecting Lyapunov exponents and spectral functions in central spin models*. Minneapolis, MN

March 2024. *Universality in relaxation dynamics of systems near integrability*. Minneapolis, MN

May 2023. *Adiabatic evolution of matrix product states with the adiabatic gauge potential*. Boston University, MA.

March 2023. *Integrable Attractors in the Adiabatic Landscape of Chaotic Systems*. APS March Meeting. Las Vegas, NV.

May 2021. *Optimal Control and Circuit Synthesis of Quantum Gates*. Williams College, MA.

July 2018. *Dynamics of adhesive wetout and detachment*. UMass Amherst Soft Matter Day. Amherst, MA.

Posters

June 2024. *Integrability as an attractor of adiabatic flows*. GEONEQ, MPI-PKS.

August 2019. *Fast and High-Fidelity Quantum Logic Gates for Parametrically Coupled Transmons*. Williams College, MA.

August 2018. *Dynamics of adhesive wetout and detachment*. Williams College, MA.

Awards and Honors

2021 **Phi Beta Kappa Induction**, PBK
2018-2020 **Summer Science Research Fellowship**, Williams College

Teaching Experience

2022 **General Physics I**, Boston University
2021 **Introduction to Physics**, Boston University
2020 **Algorithm Design and Analysis**, Williams College
2019 **Mathematical Methods for Scientists**, Williams College

Skills

Languages **Python, Julia, C++, MATLAB**
Tech **Git, High Performance Computing, Parallel Computing, Mathematica**