

Diyi Liu

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ACADEMIC POSITIONS	<i>Postdoc Scholar</i> <i>Lawrence Berkeley National Laboratory</i>	<i>2025 June - Present</i>
EDUCATION	<i>Ph.D. in Applied Mathematics</i> University of Minnesota , Minneapolis, MN • Advisor: Prof Mitchell Luskin	2019 Sept-2025 April
	<i>M.Sc. Applied Mathematics</i> University of Minnesota , Minneapolis, MN • Minor: Mechanics	2019 Sept-2022 March
	<i>Summer Break</i>	2019 July - 2019 Aug
	<i>B.S in Mathematics and Applied Mathematics</i> Zhiyuan College in Shanghai Jiao Tong University, Shanghai, SH	2015 Sept-2019 July
RESEARCH INTERESTS	• Theory and Computation: Numerical Analysis, Applied Analysis, Probability Theory, Quantum Computing and Information, Scientific Machine Learning, Mathematical Physics • Applications: Condensed Matter Physics, Quantum Technology	
AWARDS	• <i>Willard Miller Jr. Fellowship</i>, Jan 2024 • <i>ICIAM Travel Award</i>, Aug 2023 • <i>IBM Access Award</i> , May 2022 • <i>NSF MSGI Fellowship</i>, June 2021 • <i>Hanying Juhua Fellowship</i>, Nov 2017 • <i>Meritorious Winner of Interdisciplinary Contest in Modeling</i>, Mar 2017 • <i>Kaiyuan Fellowship</i>, Nov 2016 • First Prize, National Mathematical Olympiad(Beijing Area), 2013	
TEACHING	• Fall 2019-TA-Math 1271 Calculus I, Sec072 Sec073 • Spring 2020-TA-Math 2243 Linear Algebra and Differential Equation Sec012 • Fall 2020-TA-MATH 2263 -Multivariable Calculus Sec017 • Fall 2021-Grader- MATH8401 Mathematical Modeling and Methods of Applied Mathematics • Spring 2022-Grader- MATH8402 Mathematical Modeling and Methods of Applied Mathematics • Fall 2022-Instructor-Math 1271 Calculus I	

- Spring 2024-Computer Lab- MATH 2374: CSE Multivariable Calculus and Vector Analysis
- Fall 2024-Grader-MATH8401 Mathematical Modeling and Methods of Applied Mathematics
- Fall 2024-Grader-MATH5590 Mathematics of Quantum Computing

Work in progress

1. Liu D., Watson A. and Luskin M. Continuum Model of Transition-metal dichalcogenide, *In preparation*
2. Junge M., Cazeaux P., Liu D. Preparing ground state with open quantum system, *In preparation*

Publications

10. Cervia MJ, Lamm H, Liu D, Murairi EM, Zhu S. [Magic State Distillation using Asymptotically Good Codes on Qudits](#)
9. Liu D., Zhu S. and Lin L., Low G., Yang C. [Block Encoding with Low gate count for second quantized Hamiltonian](#), *arXiv:2510.08644*
8. Fang D., Liu D, Zhu S. [High order Magnus Expansion for Hamiltonian Simulation](#), *arXiv:2509.06054*
7. Gustafson E., Lamm.H., Liu D., Murairi E., Zhu S. [Synthesis of Single Qutrit Circuits](#), *arXiv:2503.20203*
6. Fang D., Liu D, Sarka R. [Time-dependent Hamiltonian Simulation via Magnus Expansion and Superconvergence for the Schrödinger equation](#), *Communications in Mathematical Physics*
5. Liu D., Du W. and Lin L., Vary J, Yang C. [Block Encoding for Pairing Hamiltonian](#), *Journal of Computational Science*
4. Kong T., Liu D., Watson A. and Luskin M. [Quantum dynamics of Twisted bilayer graphene](#), *SIAM Journal on Applied Mathematics*
3. Liu D., Watson A., Hott M., Carr S. and Luskin M. [Learning the local density of states of a bilayer moiré material](#), *Multiscale Modeling and Simulation*
2. Liu, D., Luskin, M., Carr, S. [Seeing moiré: convolutional network learning applied to twistrionics](#), *Physical Review Research*, Dec 2022
1. Bassman, L., Klymko, K., Liu, D., Tubman, N. M., and de Jong, W. A. [Computing free energies with fluctuation relations on quantum computers](#), *Physical Review Letter*, Aug 2022

SERVICES

Applied Math Seminar

1. Organize a student-run bi-weekly seminar on UMN computational and applied math, Fall 2022

CONFERENCE AND PRESENTATION

Talks

12. Block encoding with low gate count for second quantized Hamiltonian, UIUC Quantum Math Group, Sept 2025
11. Data Driven Approach for Local Density of State on the Moiré Scale, SIAM Conference on Mathematical Aspects of Materials Science, May 2024
10. Improving DFT simulation for Twisted Bilayer Graphene, SIAM Conference on Parallel Processing for Scientific Computing, March 2024
9. Introduction to Block Encoding, Quantum Information Science Seminar, UMN, Jan 2024

8. Young Researcher Seminar of IPAM Quantum Long Program, Nov 2023
7. Quantum dynamics for incommensurate system, ICIAM 2023(Japan), Aug 2023
6. Quantum Seminar(Virtual), Shanghai Jiao Tong University, June 2023
5. Approximation of Free Energies with fluctuation relations on quantum hardware, APS March Meeting(Chicago), March 2022
4. Quantum numerical linear algebra junior participant introduction talk (Virtual), Institute for Pure and Applied Mathematics, Jan 2022
3. METTS Sampling and Free Energy Computation, Lawrence Berkeley National Laboratory(Virtual), Aug 2021
2. Image Segmentation with Kernel Flow algorithm and Fast Multi-scale Eigensolver, Shanghai Jiao Tong University, Jun 2019
1. Classification of large scale lyme disease data, Institute for Pure and Applied Mathematics, Aug 2018

Conference

6. APS March Meeting, Minneapolis March 2024
5. The Mathematics and Physics of Moire Superlattices, Banff International Research Station, Oct 2023
4. Moiré Materials Workshop, Flatiron Institute CCQ, May 2023
3. AWM Research Symposium, Minneapolis, June 2022
2. Mathematics and Physics at the Moiré Scale, IPAM, May 2022
1. Simons Collaboration on Ultra-Quantum Matter Annual Meeting, NYC Jan 2022

Poster

3. Moire Materials Magic Workshop, Flatiron Institute, May 2025
2. Magnus expansion with superconvergence, Quantum Information Processing Poster Session, Feb 2025
1. Computing Sciences Summer Program 2023 Poster Session

Summer School

3. Stochastic Quantization, MSRI, Berkeley, July 2024
2. Recent Trends in Partial Differential Equations — Summer School, Duke University, August 22-26, 2022
1. Differential Equations Summer School Hertford College, University of Oxford, Aug 2016