

MENGXIN DU

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EDUCATION

Doctor of Philosophy in Physics University of Texas at Dallas, Richardson, TX Advisor: Chuanwei Zhang	Aug 2025
Master of Science in Physics Brown University, Providence, RI Thesis: Evaluation of Scarlet for realistic weak lensing mass measurements Advisor: Ian Dell' Antonio	May 2019
Bachelor of Science in Physics University of Science and Technology of China, Hefei, Anhui, China Thesis: Verification of Randomness in Quantum Physics Advisor: Yongsheng Zhang	May 2017

TECHNICAL SKILLS

Programming:	C, Python, MATLAB, Julia, Mathematica
Software:	Linux, Microsoft Office, LaTeX, Pennylane, Pytorch, Qiskit, Matplotlib, Numqi, Parallel Computing (Launcher), GPU Computing (CuPy, Numba)
Technique/Platform:	Github, Cold Atomic System Simulation (GP), Open Quantum System Simulation (SSE, MCTDH, Linblad, TEBD), Quantum Network Simulation, Many Body System Simulation, Neural Network Training, General Machine Learning, Critical Exponent Estimation

EMPLOYMENT HISTORY

Research Assistant, University of Texas at Dallas, Richardson, TX, Aug 2021 - Aug 2025

- Advisor: Prof. Chuanwei Zhang
- Initialized projects through constructive discussions
- Conducted collaborative researches in various fields
- Advised junior students and assisted swift adaptation to lab works

Teaching Assistant, University of Texas at Dallas, Richardson, TX, Aug 2019 - May 2020

- Lectured and organized a class of 100+ students
- Managed elementary lab equipment

RESEARCH EXPERIENCE

Interacting dynamical Anderson Metal-Insulator transition in kicked Bose-Einstein condensates: The effect of trapping potentials. Jun 2022 - Dec 2024
Advisor: Chuanwei Zhang (Department of Physics, The University of Texas at Dallas, Richardson, Texas), Subhadeep Gupta (Department of Physics, University of Washington, Seattle, Washington)

- Investigated cold atom systems with aperiodic drive (experimental works lead by Prof. Gupta)
- Created synthetic Anderson Metal-Insulator transition with many body interactions
- Simulated realistic dynamics in experiments and predicted the phase diagram
- Analyzed phase transition and identified as a novel type of phase transition
- Collaborational work accepted. Theoretical preprint publication expected in June 2025

Time Crystals with Time Independent Hamiltonians in Optical Cavity. Dec 2023 - Present
Advisor: Michael Kolodrubetz (Department of Physics, The University of Texas at Dallas, Richardson, Texas)

- Inspired by driven Majorana model with short edge modes, we found strong signals found in its Ising counterpart in optical cavity
- Realized totally time independent Hamiltonian with experimentally realistic observables by mapping Floquet Hamiltonian to extended zone picture in cavity QED
- Discovered a novel type of time crystal in equilibrium circumventing the no-go theorem
- Preprint publication expected in June 2025

Characterizing Quantum Codes via the Coefficients in Knill-Laflamme Conditions. Jun 2024 - Sep 2025
Advisor: Bei Zeng (Department of Physics, The University of Texas at Dallas, Richardson, Texas)

- Developed novel mathematical framework using signature vectors to analyze quantum error-correcting codes through Knill-Laflamme coefficients
- Formulated optimization algorithm on Stiefel manifolds to systematically explore quantum code spaces
- Characterized cyclic symmetry preserving paths between known quantum codes, providing new insights into code relationships
- Identified new classes of quantum codes in ((7,2,3)) and ((6,2,3))
- Preprint published at arXiv:2410.07983, submitted to *npj Quantum* for peer review

Coherent Matter Wave Emission from Atomtronic Transistors Jun 2024 - Aug 2025
Advisors: Michael Kolodrubetz and Chuanwei Zhang (Department of Physics, The University of Texas at Dallas, Richardson, TX)

- Investigated coherent atom transport in a triple-well Bose–Einstein condensate modeled by the time-dependent Gross-Pitaevskii equation
- Simulated transistor-like dynamics showing resonant tunneling between source, gate, and drain wells
- Identified coherence peaks corresponding to single-particle resonances rather than interaction-induced broadening
- Demonstrated that matter-wave coherence is maximized in the weakly interacting regime, contrasting previous many-body predictions

HONORS AND AWARDS

Margie Renfrow Student Support Fund, University of Texas at Dallas 2024
 Physics Scholarships Committee, University of Texas at Dallas

PUBLICATIONS

Journal Publications Accepted

Jun Hui See Toh, **Mengxin Du**, Xinxin Tang, Ying Su, Tristan Rojo, Carson O. Patterson, Nicolas R. Williams, Chuanwei Zhang, and Subhadeep Gupta. "Many-Body Anderson Metal-Insulator Transition using Kicked Quantum Gases." arXiv preprint arXiv:2305.14817 (2023).

Arxiv Publications (Submitted to npj Quantum Information)

Sasanka Dowarah, **Mengxin Du**, Alan Zanders, Shengwang Du, Michael Kolodrubetz, and Chuanwei Zhang. "Coherent Matter Wave Emission from an Atomtronic Transistor," arXiv preprint arXiv:[2510.03398 \(2025\)](https://arxiv.org/abs/2510.03398)

Mengxin Du, Chao Zhang, Yiu-Tung Poon, and Bei Zeng. "Characterizing Quantum Codes via the Coefficients in Knill-Laflamme Conditions." arXiv preprint arXiv:2410.07983 (2024).

Publications in Draft(planned to be published by December)

Mengxin Du and Chuanwei Zhang. "Effect of many-body interaction on synthetic Anderson Metal-Insulator transition in kicked quantum gases"

Mengxin Du, Sasanka Dowarah, Samuel Begg, Saeed Rahamanian, Mohsen Yarmohammadi and Michael Kolodrubetz. "Cavity Induced Time Crystals in Spin Chains" arXiv preprint arXiv:2410.07983 (2024).

Conference Papers (Abstract-Reviewed)

Mengxin Du and Chuanwei Zhang, “Effect of many-body interaction on synthetic Anderson Metal-Insulator transition in kicked quantum gases,” APS March Meeting 2023

Mengxin Du and Chuanwei Zhang, “Interacting dynamical Anderson Metal-Insulator transition in kicked Bose-Einstein condensates: the effect of trapping potentials,” APS March Meeting 2024

SERVICE EXPERIENCE

Symposium Chair

APS March Meeting, Las Vegas, NV, Session T66: Quantum Gases II, Mar 2023

CMD/QIS seminar Chair:

University of Texas at Dallas, Department of Physics, Internal weekly meeting, 2021-2023

Volunteer Instructor

Quantum Information Summer Camp, University of Texas at Dallas, Summer 2023

PROFESSIONAL MEMBERSHIPS

Graduate Student Member, American Physical Society,

Jun 2022 - Present

LANGUAGES

English: Advanced Speaker, **Chinese:** Native Speaker, **Japanese:** Native Speaker