

Haotian WEI

Quantum Scientist and Engineer

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EDUCATION

Ph. D. in Physics , Rice University, <i>Houston, TX</i>	Expected May 2026
M. Sc. in Physics , Rice University, <i>Houston, TX</i>	Dec 2024
B.Sc. in Physics , Fudan University, <i>Shanghai, China</i> Outstanding Graduate of Class 2020	Jun 2020
Visiting Student , University of California, <i>Berkeley, CA</i> , GPA: 4.00/4.00	Aug - Dec 2017

RESEARCH EXPERIENCE

Doctoral Researcher , <i>Rice University, Houston, TX</i> Advisor: Dr. Kaden Hazzard	Jun 2021 - Present
<ul style="list-style-type: none">Proposed a universal and efficient variational framework to simulate fermionic quantum matters with exponential speedup over classical algorithmsDeveloped Riemannian-manifold-optimization-based dynamical simulation package to explain the world's first fermion 2d optical tweezer array experiment data and precisely engineer its effective model parameters of arbitrary geometry, related works featured <i>Editors' Suggestion</i> in professional research journals <i>Physical Review Letters</i> and <i>Physical Review A</i> and in public science news magazine <i>Physics Magazine</i>Unveiled a universal thermodynamical law in the above quantum system, research featured <i>Editors' Suggestion</i> in <i>Physical Review A</i>Developed state-of-the-art Exact Diagonalization code of SU(N) Fermi-Hubbard Model (FHM) in arbitrary graphsPerformed large-scale computations and derived the world's first thermometry on the coldest quantum fermion system in the universe - ultracold SU(6) Fermi gas in an optical latticeHelped con calculations to discover the universal thermodynamical law behind SU(N) FHMRelated findings gained media coverage in 50+ media outlets across 10 languages, including <i>BBC News Mundo</i> (Spanish), <i>SRF</i> (German) and <i>physics.org</i>	
Research Assistant , <i>Fudan University, Shanghai, China</i> Advisor: Dr. Yang Qi	Sep 2018 – Jun 2020
<ul style="list-style-type: none">Built a C++-based learning scheme from scratch without existing ML libraries, including deriving back-propagation, implementing SGD, and training on Monte-Carlo-generated sample sets, to learn effective statistical physics modelsPredicted phase diagram of triangular lattice quantum Ising model by field theory analysisPerformed Monte-Carlo-based dynamical simulation in C++ for a Berezinskii-Kosterlitz-Thouless transition modelCompleted Bachelor's thesis and published relevant research work with broad reception	

PUBLICATIONS

6 peer-reviewed papers 200+ citations 3 Editors' Suggestions scholar.google.com/citations?user=mu--7-UAAAAJ	
<ul style="list-style-type: none">Haotian Wei, Eduardo Ibarra-García-Padilla, Michael L. Wall, and Kaden R. A. Hazzard. "Hubbard Parameters for Programmable Tweezer Arrays" <i>Physical Review A [Editors' Suggestion]</i> 109, 013318 (2024).Dasom Kim, Sohail Dasgupta, Xiaoxuan Ma, Joong-Mok Park, Haotian Wei, Liang Luo, Jacques Doumani, Xinwei Li, Wanting Yang, Di Cheng, Richard HJ Kim, Henry O Everitt, Shojiro Kimura, Hiroyuki Nojiri, Jigang Wang, Shixun Cao, Motoaki Bamba, Kaden RA Hazzard and Junichiro Kono. "Observation of the magnonic Dicke superradiant phase transition" <i>Science Advances [Featured in news]</i> 11, adt1691 (2025).Zoe Z. Yan, Benjamin M. Spar, Max L. Prichard, Sungjae Chi, Haotian Wei, Eduardo Ibarra-García-Padilla, Kaden R. A. Hazzard, and Waseem S. Bakr. "Two-Dimensional Programmable Tweezer Arrays of Fermions" <i>Physical Review Letters [Editors' Suggestion] [Featured in news]</i> 129.123201 (2022).Shintaro Taie, Eduardo Ibarra-García-Padilla, Naoki Nishizawa, Yosuke Takasu, Yoshihito Kuno, Haotian Wei, Richard T. Scalettar, Kaden R. A. Hazzard, and Yoshiro Takahashi. "Observation of Antiferromagnetic Correlations in an Ultracold SU(N) Hubbard Model" <i>Nature Physics [Featured in news]</i> 18.1356–61 (2022).Ibarra-García-Padilla, Eduardo, Sohail Dasgupta, Haotian Wei, Shintaro Taie, Yoshiro Takahashi, Richard T. Scalettar, and Kaden R. A. Hazzard. "Universal Thermodynamics of an SU(N) Fermi-Hubbard Model" <i>Physical Review A [Editors' Suggestion]</i> 104.043316 (2021).Yuan Da Liao, Han Li, Zheng Yan, Haotian Wei, Wei Li, Yang Qi, and Zi Yang Meng. "Phase Diagram of the Quantum Ising Model on a Triangular Lattice under External Field" <i>Physical Review B</i> 103.104416 (2021).	

CONFERENCE PRESENTATIONS

Orals:

- “Fermionic programmable quantum simulators running variational algorithms”, *APS DAMOP Meeting* 2024.
- “Parameters and algorithms for programmable Fermi-Hubbard tweezer arrays for quantum simulations”, *Rice Quantum Group Meeting* 2023.
- “Effective Hubbard parameters for programmable tweezer arrays”, *APS March Meeting* 2023.
- “Hubbard parameters of optical tweezer arrays in arbitrary 1- and 2-D geometries”, *IUPAP Conference on Computational Physics* 2022.
- “Stroboscopic fermion tweezer arrays: heating and Hubbard parameters”, *APS DAMOP Meeting* 2022.

Posters:

- “A universal and efficient fermionic variational quantum simulator”, *ITAMP Winter School* 2025, *eQMA Spring School* 2025, *QuantIPS* 2025, and *APS DAMOP Meeting* 2025.
- “Programmable Hubbard model in tweezer arrays”, *RCQM Workshop* 2022 and *QuantIPS* 2023.

PROFESSIONAL SKILLS

Proficient Programming Languages: Python (NumPy/SciPy/PyTorch), C/C++, MATLAB, Mathematica & Julia

Algorithms: Variational Quantum Algorithms, Numerical Analysis, Optimization Algorithms, Monte Carlo Sampling, Large-scale Tensor Network Algorithms, matrix decomposition algorithms especially Arnoldi/Lanczos method, data correlation analysis

Expertise in Quantum Hardware: Neutral Atom, Ion Traps, Superconducting Qubits, Quantum Dots

Application Skills: High-performance scientific computing (HPC), cloud computing, Git workflow, data visualizations (Matplotlib/Inkscape/MATLAB),

GitHub Profile: github.com/htwei17

- *Pymanopt* - extended core functionality of an 800+★ Riemannian manifold optimizer
- *HubbardTweezer* - individually created and maintain parameter-engineering package of next-gen quantum simulator

Languages: English (fluent), Mandarin (native)

Interests: Linguistics (phonetics and phonology), Saxophone

LEADERSHIP & OUTREACH

Physics & Astronomy Graduate Student Association (PAGSA), Rice University, Houston, TX Jun 2022 – Jun 2024

- Managed a \$10k annual budget and launched Rice’s first American Physics Society (APS) student chapter
- Organized 25+ events (journal clubs, faculty-candidate visits and open houses) that attracts 400+ attendees

Academic Journal Reviewer

Aug 2024 - Present

PRX Quantum, Physical Review Letters, Physical Review A & B, New Journal of Physics

APS March Meeting 2023, Las Vegas, NV

Mar 2023

- Chaired a session in the world’s largest physics conference with 14,000+ attendees