

Bohan Lu

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Education

- 2023–present **PhD in Electrical and Computer Engineering**, *Duke University*, Durham, NC, expected 2027
Advisor: Kenneth R. Brown
- 2019–2022 **MSc in Physics**, *Freie Universität Berlin*, Germany
Thesis: *Entanglement dynamics of a many-body localized system*, advisor: Jens Eisert
- 2015–2019 **BA in Mathematics and Physics**, *Washington University in St. Louis*
Cum Laude, Distinction in Mathematics, High Distinction in Physics. Thesis: *Reduced density operators of finite-sized Heisenberg XXZ chains*

Publications

- 2026 **Building codes with transversal CCZ using projective geometry and SAT solvers.** B. Lu, K. R. Brown. Preprint, arXiv:2610.09341. Code and data: github.com/jerrylvx/gate2code-public
- 2024 **Measuring out quasi-local integrals of motion from entanglement.** B. Lu, C. Bertoni, S. J. Thomson, J. Eisert. *Communications Physics* **7**, 17 (2024). doi:10.1038/s42005-023-01478-5, arXiv:2301.01787

Research Experience

- 2023–present **Doctoral Research**, *Duke University*, Brown group
- Constructed CSS codes with three logical qubits whose logical CCZ gate is implemented by transversal physical $T/T^\dagger$ gates, at thirteen block lengths from $n = 48$ to $n = 496$, by combining projective geometry with SAT solving.
 - Proved that no CSS code with three logical qubits, Z -distance at least 3, and a quasi-transversal CCZ gate exists below $n = 39$.
 - Released the code, data, and verification programs for every construction (gate2code-public).
 - Designed a dynamical error-correcting code from a minimally non-local hypergraph product code (posters at QIP 2025 and QEC 2025).
 - Developed stim-floquet, an open-source Python package for Floquet measurement schedules, GF(2) homology checks, and local detector discovery for CSS codes, with Stim circuit output.
- May–Aug 2026 **Architecture Intern**, *Xanadu Quantum Technologies*, remote
Research on decoding for quantum LDPC codes. Supervisor: Ben Baragiola.
- Oct 2025–Aug 2026 **Consulting Contractor**, *Xanadu Quantum Technologies*, remote
Research on fault-tolerant quantum computing architecture. Supervisor: Rafael Alexander.
- Jul–Oct 2022 **Research Intern**, *HQS Quantum Simulations GmbH*, Karlsruhe, Germany
Developed and benchmarked a spectral resolution method based on Hermite polynomials for resonant-level models, documented in an internal report. Supervisor: Peter Schmitteckert.
- 2021–2022 **Master's Thesis Research**, *Freie Universität Berlin*, Germany
- Proposed a protocol to extract the local integrals of motion of a many-body localized system from its entanglement dynamics, published as the Communications Physics paper above.
 - Ran tensor-network simulations on computing clusters and analyzed quantum-information bounds on entanglement growth.

- 2017–2018 **Greg Delos Fellowship**, *Washington University in St. Louis*
Studied the space of reduced density operators of finite-sized XXZ Heisenberg ground states. Computed their convex set with the Bethe ansatz and DMRG, and searched for phase-transition signatures with a support vector machine. Advisor: Alexander Seidel. Talk at APS March Meeting 2019.
- 2016–2017 **Undergraduate Research**, *Washington University in St. Louis*
Gauss–Bonnet theorem for two-dimensional closed orbifolds (advisor: Tang Xiang). Maximum-likelihood search for extended halos around TeV blazars (advisors: Manel Errando, Henric Krawczynski).

Talks and Posters

- 2026 *Small codes with transversal T implementing a logical CCZ gate*. Poster, QEC 2026.
- 2025 *A dynamical error-correcting code from a minimally non-local hypergraph product code*. With K. Brown. Posters, QIP 2025 and QEC 2025.
- 2023 *Improved decoding of quantum LDPC codes using neural-network enhanced belief propagation*. With A. Pesah, J. Roffe, N. Raveendran. Posters, QIP 2023 and QEC 2023 (Sydney).
- 2022 *Entanglement dynamics in a many-body localized system*. With C. Bertoni, S. Thomson, J. Eisert. Poster, CRC 183 Summer School 2022.
- 2019 *Reduced density operators of finite-sized Heisenberg XXZ chains*. With A. Seidel. Talk, APS March Meeting 2019.

Skills

- Agentic research Run research through LLM coding agents (Claude Code, Codex): research code, simulations, literature work, and paper revision.
- Scientific computing Python (NumPy, SciPy, Matplotlib), Stim, Git and GitHub, LaTeX, HPC clusters

Teaching

- Fall 2024 Teaching Assistant, ECE 520 Quantum Engineering, Duke University
- Winter 2020 Teaching Assistant, tensor-network seminar, Freie Universität Berlin
- 2016–2018 Teaching Assistant (Physics 216), grader (Math 4111), and physics help-desk mentor, Washington University in St. Louis

Awards

- 2026 Duke Graduate School Conference Travel Award