Stanford



Jeongwan Haah

Associate Professor of Physics and, by courtesy, of Mathematics

CONTACT INFORMATION

- **Administrative Contact**

  Denise Jones

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Bio

ACADEMIC APPOINTMENTS

- Associate Professor, Physics
- Associate Professor (By courtesy), Mathematics

Teaching

COURSES

2026-27

- Introduction to Quantum Information Theory: PHYSICS 135 (Win)
- Quantum Error Correction: PHYSICS 430 (Spr)

2025-26

- Quantum Error Correction: PHYSICS 430 (Spr)

2024-25

- Quantum Error Correction: PHYSICS 430 (Win)

STANFORD ADVISEES

Doctoral Dissertation Reader (AC)

Sydney Timmerman

Postdoctoral Faculty Sponsor

Ting-Chun Lin

Doctoral Dissertation Advisor (AC)

Jeffrey Kwan

Publications

PUBLICATIONS

- **Growth and collapse of subsystem complexity under random unitary circuits** *SCIPOST PHYSICS*
  Haah, J., Stanford, D.
  2026; 21 (1)
- **Short remarks on shallow unitary circuits** *QUANTUM*
  Haah, J.
  2025; 9
- **Efficient Approximate Unitary Designs from Random Pauli Rotations** *COMMUNICATIONS IN MATHEMATICAL PHYSICS*
  Haah, J., Liu, Y., Tan, X.
  2025; 406 (12)
- **A quantum cellular automaton for every symmetry protected topological phase** *PHYSICAL REVIEW B*
  Fidkowski, L., Haah, J., Hastings, M. B.
  2025; 112 (3)
- **Topological Phases of Unitary Dynamics: Classification in Clifford Category** *COMMUNICATIONS IN MATHEMATICAL PHYSICS*
  Haah, J.
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- **Learning quantum Hamiltonians from high-temperature Gibbs states and real-time evolutions** *NATURE PHYSICS*
  Haah, J., Kothari, R., Tang, E.
  2024; 20 (6)
- **Efficient approximate unitary designs from random Pauli rotations**
  Haah, J., Liu, Y., Tan, X., IEEE COMPUTER SOC
  IEEE COMPUTER SOC.2024: 463-475
- **Invertible Subalgebras** *COMMUNICATIONS IN MATHEMATICAL PHYSICS*
  Haah, J.
  2023; 403 (2): 661-698
- **Performance of Planar Floquet Codes with Majorana-Based Qubits** *PRX QUANTUM*
  Paetznick, A., Knapp, C., Delfosse, N., Bauer, B., Haah, J., Hastings, M. B., da Silva, M. P.
  2023; 4 (1)
- **QUANTUM ALGORITHM FOR SIMULATING REAL TIME EVOLUTION OF LATTICE HAMILTONIANS** *SIAM JOURNAL ON COMPUTING*
  Haah, J., Hastings, M. B., Kothari, R., Low, G.
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- **Query-optimal estimation of unitary channels in diamond distance**
  Haah, J., Kothari, R., O'Donnell, R., Tang, E., IEEE
  IEEE COMPUTER SOC.2023: 363-390
- **Nontrivial Quantum Cellular Automata in Higher Dimensions** *COMMUNICATIONS IN MATHEMATICAL PHYSICS*
  Haah, J., Fidkowski, L., Hastings, M. B.
  2023; 398 (1): 469-540
- **Gravitational anomaly of (3+1)-dimensional Z₂ toric code with fermionic charges and fermionic loop self-statistics** *PHYSICAL REVIEW B*
  Fidkowski, L., Haah, J., Hastings, M. B.
  2022; 106 (16)
- **Classification of small triorthogonal codes** *PHYSICAL REVIEW A*
  Nezami, S., Haah, J.

2022; 106 (1)

- **Clifford quantum cellular automata: Trivial group in 2D and Witt group in 3D (vol 62, 092202, 2021)** *JOURNAL OF MATHEMATICAL PHYSICS*
  Haah, J.
  2022; 63 (7)
- **The Group Structure of Quantum Cellular Automata** *COMMUNICATIONS IN MATHEMATICAL PHYSICS*
  Freedman, M., Haah, J., Hastings, M. B.
  2022; 389 (3): 1277-1302
- **Clifford quantum cellular automata: Trivial group in 2D and Witt group in 3D** *JOURNAL OF MATHEMATICAL PHYSICS*
  Haah, J.
  2021; 62 (9)
- **Measurement sequences for magic state distillation** *QUANTUM*
  Haah, J., Hastings, M. B.
  2021; 5
- **How Dynamical Quantum Memories Forget** *QUANTUM*
  Fidkowski, L., Haah, J., Hastings, M. B.
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- **Classification of translation invariant topological Pauli stabilizer codes for prime dimensional qudits on two-dimensional lattices** *JOURNAL OF MATHEMATICAL PHYSICS*
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- **Fiber Bundle Codes: Breaking the N^{1/2} polylog(N) Barrier for Quantum LDPC Codes**
  Hastings, M. B., Haah, J., O'Donnell, R.
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- **A degeneracy bound for homogeneous topological order** *SCIPOST PHYSICS*
  Haah, J.
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- **Disentangling the Generalized Double Semion Model** *COMMUNICATIONS IN MATHEMATICAL PHYSICS*
  Fidkowski, L., Haah, J., Hastings, M. B., Tantivasadakarn, N.
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- **Exactly solvable model for a 4+1D beyond-cohomology symmetry-protected topological phase** *PHYSICAL REVIEW B*
  Fidkowski, L., Haah, J., Hastings, M. B.
  2020; 101 (15)
- **Product Decomposition of Periodic Functions in Quantum Signal Processing** *QUANTUM*
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- **Compactifying fracton stabilizer models** *PHYSICAL REVIEW B*
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  Haah, J., Hastings, M. B.
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- **Towers of generalized divisible quantum codes** *PHYSICAL REVIEW A*
  Haah, J.
  2018; 97 (4)
- **Operator Spreading in Random Unitary Circuits** *PHYSICAL REVIEW X*
  Nahum, A., Vijay, S., Haah, J.
  2018; 8 (2)
- **MAGIC STATE DISTILLATION AT INTERMEDIATE SIZE** *QUANTUM INFORMATION & COMPUTATION*
  Haah, J., Hastings, M. B., Poulin, D., Wecker, D.
  2018; 18 (1-2): 114-140
- **Distillation with Sublogarithmic Overhead** *PHYSICAL REVIEW LETTERS*
  Hastings, M. B., Haah, J.
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- **Spectrum Estimation of Density Operators with Alkaline-Earth Atoms** *PHYSICAL REVIEW LETTERS*
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- **Sample-Optimal Tomography of Quantum States**
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- **Quantum Entanglement Growth under Random Unitary Dynamics** *PHYSICAL REVIEW X*
  Nahum, A., Ruhman, J., Vijay, S., Haah, J.
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- **Glassy quantum dynamics in translation invariant fracton models** *PHYSICAL REVIEW B*
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- **Limits on the storage of Quantum information in a volume of space** *QUANTUM*
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  Haah, J., Hastings, M. B., Poulin, D., Wecker, D.
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  Zou, L., Haah, J.
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- **An Invariant of Topologically Ordered States Under Local Unitary Transformations** *COMMUNICATIONS IN MATHEMATICAL PHYSICS*
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