

Jacob Bringewatt

Curriculum Vitae

Sept. 15, 2024

Harvard University
Harvard Quantum Initiative
Department of Physics

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EDUCATION

- 2024 Ph.D., Physics, University of Maryland, College Park
2018 B.S., Physics, University of Maryland, College Park

PROFESSIONAL APPOINTMENTS

- 2024 Postdoctoral Fellow, Harvard Quantum Initiative, Harvard University

PUBLICATIONS

Highlights: 12 first author, 215+ citations, 4 Phys. Rev. Lett., h-index 8, i10-index 8

20. *J Bringewatt*, Z Steffen, M Ritter, A Ehrenberg, H Wang, B S Palmer, A Kollar, A V Gorshkov, L P García-Pintos. “Generalized geometric speed limits for quantum observables.” Preprint. (2024)
19. L P García-Pintos, T O’Leary, T Biswas, *J Bringewatt*, L T Brady, Y-K Liu. “Resilience-runtime tradeoff relations for quantum algorithms.” Preprint. (2024)
18. J D Watson, *J Bringewatt*, A F Shaw, A M Childs, A V Gorshkov, Z Davoudi. “Quantum algorithms for simulating nuclear effective field theories.” Preprint. (2023)
17. *J Bringewatt*, M Jarret, T C Mooney. “On the stability of solutions to Schrodinger’s equation short of the adiabatic limit.” Preprint. (2023)
16. P Niroula, J Dolde, X Zheng, *J Bringewatt*, A Ehrenberg, K Cox, J Thompson, M Gullans, S Kolkowitz, A V Gorshkov. “Quantum sensing with erasure qubits.” Phys. Rev. Lett. 133, 080801 (2024)
15. L P García-Pintos, K Bharti, *J Bringewatt*, H Dehghani, A Ehrenberg, N Y Halpern, A V Gorshkov. “Estimation of Hamiltonian parameters from thermal states.” Phys. Rev. Lett. 133, 040802 (2024)
14. *J Bringewatt*, J Kunjummen, N Mueller. “Randomized measurement protocols for lattice gauge theories.” Quantum 8, 1300 (2024)
13. *J Bringewatt**, A Ehrenberg*, T Goel*, A V Gorshkov. “Optimal function estimation with photonic quantum sensor networks.” Phys. Rev. Research 6, 013246 (2024)
12. A Ehrenberg*, *J Bringewatt**, A V Gorshkov. “Minimum entanglement protocols for function estimation.” Phys. Rev. Research 5, 033228 (2023)
11. *J Bringewatt*, Z Davoudi. “Parallelization techniques for quantum simulation of fermionic systems.” Quantum 7, 975 (2023)
10. L P García-Pintos, L T Brady, *J Bringewatt*, Y-K Liu. “Lower bounds on quantum annealing times.” Phys. Rev. Lett. 130, 140601 (2023)

9. T C Mooney, *J Bringewatt*, N C Warrington, L T Brady. “Lefschetz thimble quantum Monte Carlo for spin systems.” *Phys. Rev. B* 106, 214416 (2022)
8. *J Bringewatt*, L T Brady. “Simultaneous stoquasticity.” *Phys. Rev. A* 105, 062601 (2022)
7. *J Bringewatt*, I Boettcher, P Niroula, P Bienias, A V Gorshkov. “Protocols for estimating multiple functions with quantum sensor networks: geometry and performance.” *Phys. Rev. Research* 3, 033011. (2021)
6. T Qian, *J Bringewatt*, I Boettcher, P Bienias, A V Gorshkov. “Optimal measurement of field properties with quantum sensor networks.” *Phys. Rev. A (Letter)* 103, L030601. (2021)
5. *J Bringewatt*, N Sato, W Melnitchouk, J Qiu, F Steffens, M Constantinou. “Confronting lattice parton distributions with global QCD analysis.” *Phys. Rev. D.* 103, 016003 (2021)
4. *J Bringewatt*, M Jarret. “Effective gaps are not effective: quasipolynomial classical simulation of obstructed stoquastic Hamiltonians.” *Phys. Rev. Lett.* 125, 170504 (2020)
3. *J Bringewatt*, W Dorland, SP Jordan. “Polynomial time algorithms for estimating spectra of adiabatic Hamiltonians.” *Phys. Rev. A* 100 (3), 032336 (2019) Editors’ Suggestion.
2. *J Bringewatt*, W Dorland, SP Jordan, A Mink. “Diffusion Monte Carlo approach versus adiabatic computation for local Hamiltonians.” *Phys. Rev. A* 97 (2), 022323 (2018)
1. K Pushkin, C Akerlof, D Anbajagane, J Armstrong, M Arthurs, *J Bringewatt*, T Edberg, C Hall, M Lei, R Raymond, M Reh, D Saini, A Sander, J Schaefer, D Seymour, N Swanson, Y Wang, W Lorenzon. “Study of radon reduction in gases for rare event search experiments.” *Nucl. Instrum. Methods Phys. Res., Sect. A* 903, 267-276 (2018)

FELLOWSHIPS

- 2024 Harvard Quantum Initiative Postdoctoral Fellowship, Harvard University
- 2024 NRC Postdoctoral Fellowship (declined), NIST Boulder
- 2022 Charles T. Husar Fellowship in Physics, University of Maryland
- 2022 Graduate Fellow, Kavli Institute for Theoretical Physics
- 2018 Computational Science Graduate Fellow, United States Department of Energy
- 2018 Lanczos Graduate Fellow, Joint Center for Quantum Information and Computer Science
- 2014 Banneker/Key Scholar, University of Maryland

AWARDS AND HONORS

- 2024 Young Scientist, 73rd Lindau Nobel Laureate Meeting
- 2023 Board of Visitors Outstanding Graduate Student Award, University of Maryland
- 2023 Invention of the Year Finalist, University of Maryland
- 2022 Three Minute Thesis Finalist, University of Maryland
- 2019 Communicate Your Science Contest Winner, Krell Institute

GRANTS

- 2022 Institute for Robust Quantum Simulation Seed Grant
- 2022 Joint Center for Quantum Information and Computer Science Seed Grant

PATENTS/PATENT APPLICATIONS

3. T. Qian, J. Bringewatt, I. Boettcher, P. Bienias, A. V. Gorshkov, Systems and Methods for Measurement of Field Properties Using Quantum Sensor Networks, U.S. Patent Application 17/978,420, filed Aug. 17, 2023.
2. A. Ehrenberg, J. Bringewatt, A. V. Gorshkov, Minimum Entanglement Protocols for Function Estimation, U.S. Provisional Patent Application 63/397546, filed August 12, 2022.
1. J. Bringewatt, I. Boettcher, P. Niroula, P. Bienias, A. V. Gorshkov, Measurement of Multiple Functions with Quantum Sensor Networks, U.S. Provisional Patent Application 63/363171, filed April 18, 2022.

INVITED TALKS

12. “Uncertainty relations for metrology and computation.” Perimeter Institute. Dec. 2023.
11. “Uncertainty relations for metrology and computation.” MIT Special Quantum Seminar. Dec. 2023.
10. “Uncertainty relations for metrology and computation.” Harvard Quantum Initiative Quantum Fest. Dec. 2023.
9. “Uncertainty relations for metrology and computation.” JILA Science Seminar. University of Colorado, Boulder. Nov. 2023.
8. “Randomized measurement protocols for lattice gauge theories.” Glancy/Knill Group Meeting, NIST Boulder. July 2023.
7. “Towards (spin) coherent resolutions of the sign problem.” George Mason University Quantum Computing Seminar. Apr. 2023.
6. “The role of entanglement for function estimation with quantum sensor networks.” Caltech/ AWS Seminar. Dec. 2022.
5. “The role of entanglement for function estimation with quantum sensor networks.” George Mason University Quantum Computing Seminar. Feb. 2022.
4. “Lefschetz thimble quantum Monte Carlo for spin systems.” USC Condensed Matter Seminar. Nov. 2021
3. “Lefschetz thimble quantum Monte Carlo for spin systems.” MIT Computational Research in Boston and Beyond (CRIBB) seminar. Nov. 2021.
2. “Lattice data in the JAM framework.” Amherst Center for Fundamental Interactions (ACFI) Workshop on QCD Real-Time Dynamics and Inverse Problems. Oct. 2020.
1. “Confronting lattice parton densities with global QCD analysis.” AI for Nuclear Physics Workshop. Mar. 2020.

CONFERENCE TALKS

5. “Weighting God’s dice: exploiting symmetry in randomized measurement protocols.”

- DOE CSGF Annual Program Review. July 2023.
4. “Measuring functions with quantum sensor networks.” 23rd Annual SQuInT Workshop. Oct. 2021.
 3. “Effective gaps are not effective: quasipolynomial simulation of obstructed stoquastic Hamiltonians.” DOE Computational Science Graduate Fellowship Annual Program Review. July 2021.
 2. “Optimal measurement of field properties with quantum sensor networks.” March Meeting 2021. Mar. 2021.
 1. “Confronting lattice parton densities with global QCD analysis.” DNP2019. Oct. 2019.

LOCAL TALKS

19. “Harnessing quantum systems for sensing, simulation, and optimization.” Dissertation Defense. May 2024.
18. “The quantum Fisher information zoo and its applications. Gorshkov Group Meeting. May 2024.
17. “Quantum algorithms for optimization.” Davoudi Group Meeting. Feb. 2024.
16. “Uncertainty relations for metrology and computation.” United States Naval Academy Physics Seminar. Oct. 2023.
15. “Randomized measurement protocols for lattice gauge theories.” Davoudi Group Meeting. Apr. 2023.
14. “The geometry and algebra of quantum Fisher information.” Gorshkov Group Meeting. Mar. 2023.
13. “Quantum metrology: An introduction.” Davoudi Group Meeting. Mar. 2023.
12. “Simultaneous stoquasticity.” KITP Condensed Matter/Quantum Physics Seminar. Aug. 2022.
11. “The sign problem and quantum advantage.” KITP Locals Lunch Seminar. Aug. 2022.
10. “Ultimate limits for function estimation in quantum metrology.” Gorshkov Group Meeting. Jan. 2022.
9. “Minimum entanglement protocols for function estimation.” QuICS/JQI Friday Quantum Seminar. Oct. 2021.
8. “Fermionic mappings, qubit architectures, and graph coloring.” Davoudi Group Meeting. Aug. 2021.
7. “Estimating multiple functions with quantum sensor networks.” Gorshkov Group Meeting. Jan. 2021.
6. “Effective gaps are not effective.” Gorshkov Group Meeting. April 2020.
5. “Quantum sensor networks and Fisher information.” Gorshkov Group Meeting. Aug. 2019.
4. “Confronting lattice parton densities with global QCD analysis.” Jefferson Lab Theory Seminar. July 2019.
3. “Diffusion Monte Carlo approach versus adiabatic computation for local Hamiltonians.” Gorshkov Group Meeting. Aug. 2018.
2. “Diffusion Monte Carlo approach versus adiabatic computation for local Hamiltonians.” University of Maryland Undergraduate Research Showcase. May 2018

1. “Diffusion Monte Carlo approach versus adiabatic computation for local Hamiltonians.” Undergraduate Thesis Defense. May 2018.

TEACHING EXPERIENCE

- 2023 General Physics I, United States Naval Academy
- 2023 Advanced Electromagnetism (substitute lecturer), University of Maryland
- 2016 Philosophy of Quantum Mechanics (teaching assistant), University of Maryland

ADDITIONAL TRAINING/TEACHING

- 2016-18 Math tutor, University of Maryland
- 2021 Course taken, Physics Education Research for Teaching Quantum Mechanics
- 2021 Workshop attended, Intuition, Reasoning, and Conceptual Understanding in Physics
- 2020 Course taken, Introduction to Physics Education Research
- 2020 Course taken, Science Communication
- 2013-16 Martial arts instructor

RESEARCH MENTORSHIP

David Kong, undergraduate at Lycoming College
Andrew Zheng, undergraduate at University of Maryland
Yash Anand, undergraduate at University of Maryland
Anisah Khattak, undergraduate at Notre Dame of Maryland University
Othello D. Gomes, undergraduate at University of Maryland
Tarushii Goel, undergraduate at MIT
Timothy (Connor) Mooney, undergraduate at George Mason University
Akshita Gorti, undergraduate at Cornell University
Victoria Adebayo, undergraduate at Howard University
Timothy Qian, high schooler at Montgomery Blair High School

SERVICE TO THE PROFESSION

Journal referee for ACM Transactions on Quantum Computing, npj Quantum Information, Physical Review A, Physical Review Applied, Physical Review Letters, Quantum, Quantum Information Processing, Quantum Science and Technology
Conference referee for QIP, TQC

DEPARTMENTAL SERVICE

- 2021-23 Member, UMD Physics Department Graduate Student Colloquium Committee
- 2021-24 Mentor and Panelist, GRAD-MAP Winter Workshop and Summer Scholars Programs
- 2020-21 Organizer, QuICS-JQI-CMTC Friday Seminar
- 2021 Panelist, Conference for Undergraduate Underrepresented Minorities in Physics (cu2mip)
- 2019-21 Volunteer, University of Maryland Prospective Graduate Student Open Houses

OUTREACH

- 2023 Judge for Communicate Your Science Essay Contest, Krell Institute

2020-24 Skype a Scientist

2022 Proctor for U.S. Physics Olympiad $F=ma$ exam