

Summary

I'm a PhD candidate in theoretical physics at the University of Maryland, College Park and, currently, a graduate fellow at the Kavli Institute for Theoretical Physics. My research interests span many aspects of quantum information and quantum computing. Current areas of focus include adiabatic quantum computation and quantum annealing, quantum metrology, and quantum algorithms for nuclear theory.

Education

University of Maryland, College Park	COLLEGE PARK, MARYLAND
PhD in Physics Advisor: Alexey Gorshkov	2018 – 2023 (<i>Expected</i>)
Bachelor of Science in Physics Cum laude with high honors in physics.	2014 – 2018

Fellowships, Honors, and Awards

Research Fellowships	
KITP Graduate Fellow Kavli Institute for Theoretical Physics	Fall 2022
Computational Science Graduate Fellow (CSGF) Department of Energy	2018-2022
Lanczos Graduate Fellow Joint Center for Quantum Information and Computer Science (QuICS), University of Maryland, College Park	2018-2020
Banneker/Key Scholar University of Maryland, College Park	2014-2018
Grants	
Institute for Robust Quantum Simulation (RQS) Seed Grant Funding Agency: National Science Foundation (NSF) Amount awarded: \$33k	2022
Contests	
Three Minute Thesis (3MT) Contest Winner College and University Level, University of Maryland, College Park	2022
DOE CSGF Communicate Your Science Contest Winner	2019

Publications

* denotes equal contribution, † denotes alphabetical order

11. A Ehrenberg*, J Bringewatt*, A V Gorshkov. "Minimum entanglement protocols for function estimation." Preprint. (2022) [arXiv:2110.07613]
10. J Bringewatt, Z Davoudi. "Parallelization techniques for quantum simulation of fermionic systems." Preprint. (2022) [arXiv:2207.12470]

9. *J Bringewatt, L T Brady. "Simultaneous stoquasticity." Phys. Rev. A 105, 062601 (2022) [arXiv:2202.08863]*
8. *T C Mooney, J Bringewatt, L T Brady. "Lefschetz thimble quantum Monte Carlo for spin systems." Preprint. (2021) [arXiv:2110.10699]*
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) [arXiv:2104.09540]*
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) [arXiv:2011.01259]*
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) [arXiv:2010.00548]*
4. *J Bringewatt*, M Jarret*[†]. "Effective gaps are not effective: quasipolynomial classical simulation of obstructed stoquastic Hamiltonians." Phys. Rev. Lett. 125, 170504 (2020) [arXiv:2004.08681]*
3. *J Bringewatt, W Dorland, SP Jordan. "Polynomial time algorithms for estimating spectra of adiabatic Hamiltonians." Phys. Rev. A 100 (3), 032336 (2019) [arXiv:1905.07461]. 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) [arXiv:1709.03971]*
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) [arXiv:1805.11306]*

Patents/Provisional Patents

3. *A. Ehrenberg, J. Bringewatt, A. V. Gorshkov, Minimum Entanglement Protocols for Function Estimation, U.S. Provisional Patent Application 63/397546, filed August 12, 2022. Based on publication [11] above.*
2. *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. Based on publication [7] above.*
1. *T. Qian, J. Bringewatt, I. Boettcher, P. Bienias, A. V. Gorshkov, System and Method for Measurement of Field Properties Using Quantum Sensor Networks, U.S. Provisional Patent Application 63/263426, filed Nov 2, 2021. Based on publication [6] above.*

Teaching Experience

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| Designed and wrote a self-study packet on quantum computing for high schoolers | 2021 |
| Girls Talk Math Program, University of Maryland, College Park | |
| Math Tutor | 2016-2018 |
| University of Maryland, College Park | |

Mentorship

Research

Tarushii Goel Undergraduate at MIT	2022
Timothy (Connor) Mooney Undergraduate at George Mason University, now a graduate student at University of Maryland	2021-2022
Akshita Gorti Undergraduate at Cornell University	2021-2022
Timothy Qian High schooler at Montgomery Blair High School, now an undergraduate at MIT, won 5 th place Regeneron Science Talent Search for work done with me.	2020
Ivy Liang High schooler at Montgomery Blair High School.	2020

GRAD-MAP Winter Workshop

GRAD-MAP Winter Workshop is a professional development and research skill-building workshop organized via the University of Maryland's Graduate Resources for Advancing Diversity with Maryland Astronomy and Physics program.

Othello D. Gomes Undergraduate at Montgomery Community College, now an undergraduate at University of Maryland	2022
Victoria Adebayo Undergraduate at Howard University	2021

Service to the Scientific Community

Peer Review

Journals: npj Quantum Information (1), Quantum (2)
Conferences: TQC (1)

Member of UMD Physics Department Graduate Student Colloquium Committee	2021-2022
Co-Organizer of Journal Club/Reading Group on Geometry of Quantum States University of Maryland, College Park	2021-2022
Volunteer for GRAD-MAP Winter Workshop and Summer Scholars Programs	2021-2022
Organizer of QuICS-JQI-CMTC Friday Seminar University of Maryland, College Park	2020-2021
Panelist for Conference for Undergraduate Underrepresented Minorities in Physics (cu2mip) University of Maryland, College Park	2021
Volunteer at University of Maryland Prospective Graduate Student Open Houses	2019-2021

Education-related Training and Workshops

Seminar Course on Physics Education Research for Teaching Quantum Mechanics University of Maryland, College Park	2021
Workshop on Relationships Among Intuition, Reasoning, and Conceptual Understanding in Physics American Association of Physics Teachers	2021
Seminar Course on Introduction to Physics Education Research University of Maryland, College Park	2020
Workshop on Science Communication Skype a Scientist organization	2020

Outreach

Skype a Scientist Conversations with students (elementary, middle, and high school) on physics.	2020-2022
Proctor for U.S. Physics Olympiad F=ma Exam	2022
Writing for Non-scientific Audience "Spherical cows: Using barnyard animals to understand quantum computing." (2019) – won Communicate Your Science Essay Contest, published in Deixis Magazine (magazine on computational science at DoE national labs)	

Presentations

Invited Talks

4. "The role of entanglement for function estimation with quantum sensor networks." George Mason University Quantum Computing Seminar. (Feb. 2022) Invited Talk.
3. "Lefschetz thimble quantum Monte Carlo for spin systems." MIT Computational Research in Boston and Beyond (CRIBB) seminar. (Nov. 2021) Invited Talk.
2. "Lattice data in the JAM framework." Amherst Center for Fundamental Interactions (ACFI) Workshop on QCD Real-Time Dynamics and Inverse Problems. (Oct. 2020) Invited Talk.
1. "Confronting lattice parton densities with global QCD analysis." AI for Nuclear Physics Workshop. (Mar. 2020) Invited Talk.

Contributed Talks

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

Seminar Talks

13. "Simultaneous stoquasticity." KITP Condensed Matter/Quantum Physics Seminar. (Aug. 2022) Talk.

12. "The sign problem and quantum advantage." KITP Locals Lunch Seminar. (Aug. 2022) Talk.
11. "Ultimate limits for function estimation in quantum metrology." Gorshkov Group Meeting. (Jan. 2022) Talk.
10. "Lefschetz thimble quantum Monte Carlo for spin systems." USC Condensed Matter Seminar. (Nov. 2021) Talk.
9. "Minimum entanglement protocols for function estimation." QuICS/JQI Friday Quantum Seminar. (Oct. 2021) Talk.
8. "Fermionic mappings, qubit architectures, and graph coloring." Davoudi Group Meeting. (Aug. 2021) Talk.
7. "Estimating multiple functions with quantum sensor networks." Gorshkov Group Meeting. (Jan. 2021) Talk.
6. "Effective gaps are not effective." Gorshkov Group Meeting. (April 2020) Talk.
5. "Quantum sensor networks and Fisher information." Gorshkov Group Meeting. (Aug. 2019) Talk.
4. "Confronting lattice parton densities with global QCD analysis." Jefferson Lab Theory Seminar. (July 2019) Talk.
3. "Diffusion Monte Carlo approach versus adiabatic computation for local Hamiltonians." Gorshkov Group Meeting. (Aug. 2018) Talk.
2. "Diffusion Monte Carlo approach versus adiabatic computation for local Hamiltonians." University of Maryland Undergraduate Research Showcase. (May 2018) Talk.
1. "Diffusion Monte Carlo approach versus adiabatic computation for local Hamiltonians." Undergraduate Thesis Defense. (May 2018) Talk.

Posters

11. "Testing and Utilizing Quantum Speed Limits in Superconducting Systems." Institute for Robust Quantum Simulation NSF Site Visit. (Aug. 2022) Poster.
 10. "Simultaneous stoquasticity." QuICS Stakeholder Day. (Apr. 2022) Poster.
 9. "Lefschetz thimble quantum Monte Carlo for spin systems." QIP2022. (Mar. 2022) Poster.
 8. "Optimal measurement of field properties with quantum sensor networks." QuICS Admitted Students Days. (Apr. and May 2021) Poster.
 7. "Optimal measurement of field properties with quantum sensor networks." QuICS Stakeholder Day. (Mar. 2021) Poster.
 6. "Estimating multiple functions with quantum sensor networks." QuICS 5 Year Anniversary Symposium. (Jan. 2020) Poster.
 5. "Effective gaps are not effective." FARQC Kickoff Meeting. (Nov. 2019) Poster.
 4. "Polynomial time algorithms for estimating spectra of adiabatic Hamiltonians." DOE Computational Science Graduate Fellowship Annual Program Review. (July 2019) Poster.
 3. "Polynomial time algorithms for estimating spectra of adiabatic Hamiltonians." QIP2019. (Jan. 2019) Poster.
 2. "Polynomial time algorithms for estimating spectra of adiabatic Hamiltonians." STAQ Kickoff Meeting. (Nov. 2018) Poster.
 1. "Diffusion Monte Carlo approach versus adiabatic computation for local Hamiltonians." QIP2018. (Jan. 2018) Poster.
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