Jacob Bringewatt

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Summary Statement

I'm a PhD candidate in theoretical physics and a Department of Energy Computational Science Graduate fellow. 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

Doctoral Candidate in Physics — 2018–
University of Maryland, College Park
Advisor: Alexey Gorshkov

Bachelor of Science in Physics — 2014–2018
University of Maryland, College Park
Cum laude with high honors in physics.

Fellowships

KITP Graduate Fellow (Accepted)
Kavli Institute for Theoretical Physics, University of California, Santa Barbara — 2022

Computational Science Graduate Fellow
United States Department of Energy — 2018-2022

Lanczos Graduate Fellow
Joint Center for Quantum Information and Computer Science — 2018-2020

Banneker/Key Scholar
University of Maryland, College Park — 2014-2018

Publications

* EQUAL CONTRIBUTION
† ALPHABETICAL ORDER

10. *J Bringewatt*, L T Brady. "Simultaneous stoquasticity." Phys. Rev. A. Accepted. (2022) [arXiv:2202.08863]

9. T C Mooney, *J Bringewatt*, L T Brady. "Lefschetz thimble quantum Monte Carlo for spin systems." Preprint. (2021) [arXiv:2110.10699]

8. A Ehrenberg*, *J Bringewatt**, A V Gorshkov. "Minimum entanglement protocols for function estimation." Preprint. (2021) [arXiv:2110.07613]

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]

GRANTS

Institute for Robust Quantum Simulation (RQS) Seed Grant
National Science Foundation 2022
Amount awarded: $33k

AWARDS

3 Minute Thesis (3MT) Contest University-Level Winner
Graduate School
University of Maryland, College Park 2022

3 Minute Thesis (3MT) Contest College-Level Winner
College of Computer, Mathematical, and Natural Sciences (CMNS)
University of Maryland, College Park 2022

Communicate Your Science Essay Contest Winner
Krell Institute (Department of Energy Computational Science Graduate Fellowship) 2019

TEACHING EXPERIENCE

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

Math Tutor
University of Maryland, College Park 2016-2018

Teaching Assistant for Philosophy of Quantum Mechanics
University of Maryland, College Park Fall 2016

MENTORSHIP

Othello D. Gomes (Montgomery College)
For GRAD-MAP Winter Workshop project on geometry of quantum states. 2022

Connor Mooney (George Mason University)
For research project on Lefshetz thimble methods for sign problems. 2021

Akshita Gorti (Cornell University)
For a research project on quantum sensor networks. 2021

Victoria Adebayo (Howard University)
For GRAD-MAP Winter Workshop on adiabatic quantum computation. 2021

Timothy Qian (Montgomery Blair High School)
For a research project on quantum sensor networks. 2020
Outcome: Letter in Physical Review A and 5^{th} place Regeneron Science Talent Search.

EDUCATION-RELATED TRAINING AND WORKSHOPS

Seminar Course on Physics Education Research for Teaching Quantum Mechanics
University of Maryland, College Park Fall 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 Fall 2020

Workshop on Science Communication

Skype a Scientist organization 2020

Service to Scientific Community

Reviewer
Journals: Quantum
Conferences: TQC

Member of UMD Physics Department Graduate Student Colloquium Committee 2021–

Panelist at GRAD-MAP Winter Workshop 2022

Organizer of QuICS-JQI-CMTC Friday Seminar 2020–2021

Panelist at Conference for Undergraduate Underrepresented Minorities in Physics (cu2mip) 2021

Volunteer at University of Maryland Prospective Graduate Student Open Houses 2019–2021

Outreach

Skype a Scientist
Conversations with students (elementary, middle, and high school) on physics. 2020–

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)

Professional Memberships

American Physical Society (APS)

American Association of Physics Teachers (AAPT)

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

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

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.