Jacob Bringewatt *Curriculum Vitae*

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Summary

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

University of Maryland, College Park   COLLEGE PARK, MARYLAND

Ph.D. in Physics   *2018 – 2023 (Expected)*
Advisor: Alexey Gorshkov

Bachelor of Science in Physics   *2014 – 2018*
Cum laude with high honors in physics.

Fellowships, Honors, and Awards

Research Fellowships

Kavli Institute for Theoretical Physics (KITP) Graduate Fellow   *Fall 2022*

Department of Energy Computational Science Graduate Fellow (CSGF)   *2018-2022*

Lanczos Graduate Fellow   *2018-2020*
Joint Center for Quantum Information and Computer Science (QuICS), University of Maryland, College Park/National Institute of Standards and Technology (NIST)

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

Grants

Institute for Robust Quantum Simulation (RQS) Seed Grant   *2022*

Contests

Three Minute Thesis (3MT) Contest Winner   *2022*
College and University Level, University of Maryland, College Park

DOE CSGF Communicate Your Science Contest Winner   *2019*

Publications

* denotes equal contribution, † denotes 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]

Teaching Experience

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

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

Mentorship

Research

Timothy (Connor) Mooney *2021-2022*
Undergraduate at George Mason University, now a graduate student at University of Maryland, College Park

Akshita Gorti *2021-2022*
Undergraduate at Cornell University

Timothy Qian *2020*
High schooler at Montgomery Blair High School, now an undergraduate at MIT, won 5th place Regeneron Science Talent Search.

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   *2022*
Undergraduate at Montgomery Community College, now an undergraduate at University of Maryland, College Park

Victoria Adebayo   *2021*
Undergraduate at Howard University

Service to the Scientific Community

Reviewer
Journals: Quantum
Conferences: TQC

Member of UMD Physics Department Graduate Student Colloquium Committee   *2021–2022*

Volunteer for GRAD-MAP Winter Workshop and Summer Scholars Programs   *2021–2022*

Organizer of QuICS-JQI-CMTC Friday Seminar   *2020–2021*
University of Maryland, College Park

Panelist Conference for Undergraduate Underrepresented Minorities in Physics (cu2mip)   *2021*
University of Maryland, College Park

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   *2021*
University of Maryland, College Park

Workshop on Relationships Among Intuition, Reasoning, and Conceptual Understanding in Physics
2021
American Association of Physics Teachers

Seminar Course on Introduction to Physics Education Research   *2020*
University of Maryland, College Park

Workshop on Science Communication   *2020*
Skype a Scientist organization

Outreach

Skype a Scientist   *2020-2022*
Conversations with students (elementary, middle, and high school) on physics.

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

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.