Jeffrey M Epstein, PhD

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Summary

Quantum information theorist with experience in characterization and benchmarking of quantum processors. Particularly interested in approaches that provide actionable feedback for hardware improvement and comprehensive error models that allow evaluation of error correction schemes.

Professional Experience

Atom Computing, Senior Quantum Applications Engineer — CA, USA — Aug. 2021 to present

- Developed circuit-level tools for efficient and informative characterization of single and two-qubit gates. Resulting software package used internally by hardware engineers to perform rigorous analyses of gate performance. Information provided by this tool can be used to inform hardware improvement and circuit simulations.
- Led characterization/benchmarking component of DARPA US2QC program. Developed broad knowledge of state-of-the-art techniques in the analysis and error modeling of near-term quantum processors, which I presented to the testing and evaluation team composed of experts from government labs.
- Developed and studied novel state preparation algorithm for constrained optimization, leading to a publication and a patent (pending).
- Built tools based on Q-CTRL for optimization of pulse sequences on atomic platform, facilitating design of rapid gates robust against various sources of noise.
- Supervised company's first theory intern, leading to her authorship on a scientific publication.

National Institute of Standards and Technology, Postdoctoral Scholar — MD, USA — Feb. 2021 to June 2021

- National Research Council postdoctoral scholarship

University of California, Berkeley, Graduate Student Researcher — CA, USA — June. 2015 to Dec. 2020

- Physics 112 (intro. to statistical and thermal physics), Physics 7b (intro. thermodynamics and electromagnetism for scientists and engineers). Taught sections, held regular office hours, and graded problem sets and exams.

University of California, Berkeley, Graduate Student Instructor — CA, USA — Sep. 2014 to May 2015

- Physics 112 (intro. to statistical and thermal physics), Physics 7b (intro. thermodynamics and electromagnetism for scientists and engineers). Taught sections, held regular office hours, and graded problem sets and exams.

IBM Research, TJ Watson Research Center, Quantum Computing Intern — NY, USA — Sep. 2012 to June 2013

- Studied robustness of randomized benchmarking (RB) under varying noise models, leading to a highly-cited publication used in the field as evidence for the validity of RB for benchmarking quantum processors subject to realistic physical noise.

Education

University of California, Berkeley, PhD in physics — CA, USA — Sep. 2014 to Dec. 2020

- Dissertation: *Statistical Mechanics of Transport Processes in Active Matter*

Perimeter Institute for Theoretical Physics, MSc in Theoretical Physics — ON, CAN — Sep. 2013 to June 2014

- Perimeter Scholars International program

Harvard College, AB in Chemistry and Physics — MA, USA
Sep. 2008 to May 2012

- *magna cum laude* with high honors in field
- secondary field, Mathematics; language citation, Chinese

Publications

1. *Note on simple and consistent gateset characterization including calibration and decoherence errors*. **JME**. arXiv:2402.17727 (2024)
2. *Subspace Correction for Constraints*. K Pawlak, **JME**, D Crow, S Gandhari, M Li, T Bohdanowicz, J King. arXiv:2310.20191 (2024)
3. *Iterative assembly of* $^{171}\mathrm{Yb}$ *atom arrays in cavity-enhanced optical lattices*. M Norcia *et al.* arXiv:2401.16177 (2024)
4. *Mid-circuit qubit measurement and rearrangement in a* $^{171}\mathrm{Yb}$ *atomic array*. M Norcia *et al.* arXiv:2305.19119 (2023)
5. *Thermally driven quantum refrigerator autonomously resets superconducting qubit*. M Aamir, P Suria, J Guzmán, C Castillo-Moreno, **JME**, N Yunger Halpern, S Gasparinetti. arXiv:2305.16710 (2023)
6. *Odd Diffusivity of Chiral Random Motion*. C Hargus, **JME**, KK Mandadapu. Phys. Rev. Lett. 127, 178001 (2021).
7. *Quantum noise limits for a class of nonlinear amplifiers*. **JME**, KB Whaley, J Combes. Phys. Rev. A 103 (5), 052415 (2021).
8. *Time reversal symmetry breaking and odd viscosity in active fluids: Green-Kubo and NEMD results*. C Hargus, K Klymko, **JME**, KK Mandadapu. J. Chem. Phys. 152, 201102 (2020).
9. *Time reversal symmetry breaking in two-dimensional non-equilibrium viscous fluids*. **JME**, KK Mandadapu. Phys. Rev. E 101, 052614 (2020).
10. *Continuous quantum error correction for evolution under time-dependent Hamiltonians*. J Atalaya, S Zhang, MY Niu, A Babakhani, HCH Chan, **JME**, KB Whaley. arXiv:2003.11248 (2020).
11. *Statistical Mechanics of Transport Processes in Active Fluids II: Equations of Hydrodynamics for Active Brownian Particles*. **JME**, K Klymko, KK Mandadapu. J. Chem. Phys. 150, 164111 (2019).
12. *Postponing the orthogonality catastrophe: efficient state preparation for electronic structure simulations on quantum devices*. NM Tubman, C Mejuto-Zaera, **JME**, D Hait, DS Levine, W Huggins, Z Jiang, JR McClean, R Babbush, M Head-Gordon, KB Whaley. arXiv:1809.05523 (2018).
13. *Quantum Speed Limits for Quantum Information Processing Tasks*. **JME**, KB Whaley. Phys. Rev. A 95, 042314 (2017).
14. *Investigating the Limits of Randomized Benchmarking Protocols*. **JME**, AW Cross, E Magesan, and JM Gambetta. Phys. Rev. A 89, 062321 (2014)
15. *CD36 in the periphery and brain synergize in stroke injury in hyperlipidemia*. E Kim, M Febbraio, Y Bao, AT Tolhurst, **JME**, S Cho. Annals of Neurology. 71(6) (2012)

Awards

NIST NRC Postdoctoral Research Associateship, 2021
National Defense Science and Engineering Graduate (NDSEG) Fellowship, 2016 - 2021