JAMES SUD

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EDUCATION

University of Chicago   **Oct 2022-present**

Ph.D candidate in Computer Science. Advisor: Dr. Fred Chong. Focus in quantum computing.

University of California, Berkeley   **Aug 2016 – May 2020**

B.S. in Physics, Minor in Computer Science, GPA: 3.9. High Distinction (magna cum laude equiv.)

RESEARCH EXPERIENCE

Research Assistant   **Oct 2020-present**

Universities Space Research Association, NASA Academic Mission Services

- Deriving the effects of various error channels on the expectation values of quantum and classical Hamiltonians, implementing methods to simulate these noisy expectation values.
- Numerically exploring entanglement in the Quantum Approximate Optimization Algorithm (QAOA). Co-wrote publication on entanglement witnesses for QAOA.
- Numerically/analytically investigating parameter settings and behavior of QAOA for combinatorial optimization problems under restricted parameter schedules

Feynman Quantum Academy Intern   **May 2020 – June 2020 / Aug 2020 – Oct 2020**

Universities Space Research Association, NASA Academic Mission Services

- Programmed and benchmarked a novel approach using QAOA for graph coloring into Rigetti's PyQuil Framework. Implemented error mitigation strategies in collaboration with Rigetti's hardware team. Developed compilation scheme to reduce the number of SWAPS required on a linear lattice of qubits for graph coloring QAOA.

Quantum Computing Summer School Fellow   **June 2020 – Aug 2020**

Los Alamos National Laboratory, Quantum Computing Summer School

- Programmed and tested an algorithm for simulating small molecules on a quantum computer using a shot-frugal variational quantum/classical algorithm as well as a novel approach for reducing the depth of the Variational Quantum Eigensolver algorithm
- Co-led writing and published latter of the above projects in PRX Quantum journal
- Participated in and attended lectures on frontiers in near-term quantum algorithms

Quantum Programmer, Lawrence Berkeley National Laboratory (unpaid)   **Dec 2019 – June 2020**

- Programmed and tested a lab-developed algorithm for high energy physics simulations in Google's quantum computing framework Cirq. Work currently being extended to publication.

Project Group Leader, Quantum Computing @ Berkeley Club (unpaid)   **Sept 2019 – May 2020**

- Led a project to numerically test if the Quantum Approximate Optimization Algorithm for Max-Cut can reveal properties of the underlying graph it is called on.

- Designed, presented, a published work on a quantum annealing algorithm for assigning students to dorms to maximize social distancing in light of the COVID-19 pandemic.

- Attended and presented theoretical papers in quantum computing weekly

Research Affiliate, Lawrence Berkeley National Laboratory (unpaid)   **Aug 2017 – Aug 2018**

- Researched and organized data on the economic viability of various renewable energies in China, helped compile reports on mitigation of greenhouse gases for the China Energy Group

PUBLICATIONS/PREPRINTS

1. **Sud, James,** Tkachenko, Nikolay V., et al. "Correlation-Informed Permutation of Qubits for Reducing Ansatz Depth in the Variational Quantum Eigensolver." *PRX Quantum*, vol. 2, no. 2, 2021, doi:10.1103/prxquantum.2.020337.
2. **Sud, James** et al. "Dual Map Framework for Noise Characterization of Quantum Computers." *Physical Review Applied,* vol. 106, iss. 1, 2022, doi: 10.1103/PhysRevA.106.012606.
3. Alam, M. Sohaib, et al. "Practical Verification of Quantum Properties in Quantum Approximate Optimization Runs." *Physical Review Applied*, vol. 17, iss. 2, 2022, doi: 10.1103/PhysRevApplied.17.024026.
4. **Sud, James** and Li, Victor. "A Quantum Annealing Approach to Reduce Covid-19 Spread on College Campuses." 1 Dec 2022, arxiv:2112.01220 [quant-ph]
5. Deliyannis, Plato et al. "Improving Quantum Simulation Efficiency of Final State Radiation with Dynamic Quantum Circuits." Accepted 28 June 2022, *Physical Review D*
6. **Sud, James** et al. "A Classical Parameter Setting Heuristic for the Quantum Approximate Optimization Algorithm"
7. Shen, Yizhi, et al. "Theory of Real Time Krylov Subspace Diagonalization for Quantum Computing Algorithms." 1 Aug 2022. https://arxiv.org/abs/2208.01063

CONFERENCE TALKS

1. Contributing Author: Venturelli, Davide, et al. "Quantum Optimization Experiments with Advanced Mixers and Controls." *Bulletin of the American Physical Society*, American Physical Society, 17 Mar. 2021.
2. Contributing Author: Shen, Yizhi, et al. "Theory of Real Time Krylov Subspace Diagonalization for Quantum Computing Algorithms." *Bulletin of the American Physical Society*, American Physical Society, 14 Mar. 2022.
3. Contributing Author: Venturelli, Davide, et al. "Hardware-Efficient Quantum Optimization Layered Algorithms and Experiments." *Bulletin of the American Physical Society*, American Physical Society, 15 Mar. 2022.

NON-RESEARCH EMPLOYMENT HISTORY

Academic Center Assistant, UC Berkeley   **June 2017 – May 2020**

- Maintained study environment, communicated with students to resolve their academic needs.

AWARDS

National Science Foundation Graduate Research Fellowship Program (Accepted)   **Apr 2022**

Three years of funding for Ph.D. research in quantum algorithms for optimization problems.

NASA Space Technology Graduate Research Opportunities (Declined)   **Apr 2022**

Five years of funding for Ph.D. research in quantum algorithms for optimization problems.

Quantum Computing Summer School Fellowship   **June 2020 – Aug 2020**

Los Alamos National Laboratory. 1/18 selected internationally.

Olsen Memorial Fund and Jackson Award   **Fall 2018 / 2019**

UC Berkeley Physics Department. Based on academic standing and progress in the physics major

EXTRACURICCULARS

Quantum Researcher, Indigo Sound   **Sept 2020 - present**

- Assisted early-stage plan for development of an audio sampling tool using quantum machine learning. Performed computations on classical simulators and quantum hardware.

Co-Leader and Bassist, MintJulep and Komorebi Sun   **Aug 2017 – present**

- Helped record, produce, and distribute 6-track EP "Sonic Medicine" for 4-piece Jazz/Neo-Soul band MintJulep, streamed over 50k times. Performed at over 15 venues in the Bay Area.
- Wrote, arranged, recorded, produced, and engineered 12-track LP "Komorebi Album 1," released on all platforms with all proceeds to Black Lives Matter and COVID-19 relief.

Co-Founder and Co-Owner, Nebular Rides Skateboards   **Aug 2009 - June 2015**

- Designed, built, painted, marketed, and sold skateboards, t-shirts, and watercrafts to residents.

RELEVANT UPPER DIVISION COURSEWORK

UC Berkeley

Physics 137A/B: Quantum Mechanics I/II

Physics C191: Quantum Information Science and Technology

CS 294-66: Quantum Computation