JAMES SUD

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EDUCATION

University of Chicago   **Oct 2022-present**

Ph.D student 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

RESEARCH EXPERIENCE

Student Researcher   **Aug 2022-present**

Computer Science Department, Physical Sciences Division, University of Chicago

- Investigating quantum algorithms for optimization of quantum and classical objectives, including the Quantum Approximate Optimization Algorithm (QAOA)

Research Assistant   **Oct 2020-Aug 2022**

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/analytically exploring entanglement in QAOA
- Numerically/analytically investigating parameter setting strategies 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

- 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.

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, and 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." 22 Nov 2022. arxiv:2211.09270 [quant-ph]
7. Shen, Yizhi et al. "Theory of Real Time Krylov Subspace Diagonalization for Quantum Computing Algorithms." Quantum 7, 1066 (2023)
8. Maciejewski, Filip et al. "Design and execution of quantum circuits using tens of superconducting qubits and thousands of gates for dense Ising optimization problems." arXiv:2308.12423 [quant-ph]
9. Daniel Belkin et al. "Approximate t-designs in generic circuit architectures." arXiv:2310.19783 [quant-ph]

CONFERENCE TALKS

1. Speaker: "A Parameter Setting Heuristic for the Quantum Alternating Operator Ansatz."
   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   **Apr 2022-Present**

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

Musician and Producer, Deixis   **Jan 2023 – present**

- Wrote performed and produced opening theme song for The Deixis Podcast.
- Composed and arranged soundtrack for Film "Bekele." Accepted to Unpop Film Fest 2023.
- Composed and arranged soundtrack for Film "The Connoisseur."

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

- Developed a proof-of-concept audio sampling tool using quantum machine learning. Performed computations on classical simulators and quantum hardware. Sold a demonstrative NFT.

Co-Leader and Bassist, MintJulep and Sunnydew   **Aug 2017 – Jan 2023**

- 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   **Aug 2008 - June 2015**

- Designed, built, painted, marketed, and sold skateboards, shirts, and watercrafts in San Diego.