Anuj Apte

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apteanuj

Education

University of Chicago **Chicago, IL**
Candidate for PhD in Physics *2022–Current*
Selected Coursework: Machine Learning for Molecular Modelling

University of Chicago **Chicago, IL**
M.S in Physics, GPA: 4.0/4.0 *2020–2022*
Selected Coursework:
Quantum Information and Computation · Implementation of Quantum Processors · Quantum Complexity Theory

Massachusetts Institute of Technology **Cambridge, MA**
B.S. in Physics and Philosophy with minor in Music and Mathematics, GPA: 4.9/5.0 *2016–2020*
Selected Coursework:
Quantum Field Theory I,II & III · General Relativity · Differential Geometry

Research Experience

Department of Physics, University of Chicago **Chicago, IL**
Graduate Research Fellow *07/2020–Current*
- Currently developing Equivariant Neural Networks for Quantum systems
- Discovered a new class of phase transitions due to breaking of categorical symmetries
- Studied the physics of topological quantum computing and error correction

IBM Corporation **Yorktown Heights, NY**
Research Intern *05/2023–08/2023*
- Developed a deterministic technique for mitigation of measurement errors
- Built mitigation software tool for incorporation into Qiskit runtime

Xanadu Quantum Technologies **Toronto, ON**
Research Resident *05/2022–08/2022*
- Designed algorithm and software package for faster simulations of Gaussian quantum circuits
- Demonstrated 100x speedup of circuit simulation for GKP qubit preparation

NASA Quantum AI Lab **Mountain View, CA**
Research Intern *06/2021–09/2021*
- Developed theory for surprising behavior of QAOA circuits at large depth
- Studied performance of pulse-level VQE with supercomputer simulations

MIT Department of Nuclear Science and Engineering **Cambridge, MA**
Researcher *02/2019–06/2020*
- Studied Kohn anomalies in topological Weyl semi-metals using Quantum Field Theory
- Developed theory for topological signatures in neutron scattering from nodal semi-metals

Kavli Institute for Astrophysics **Cambridge, MA**
Researcher *12/2016–02/2018*
- Devised a framework to calculate inclined inspiral trajectories into Kerr black holes
- Implemented Mathematica and C++ code to numerically compute inspiral trajectories

Skills

Languages: Python, C++, Mathematica

Tools and Frameworks: Git, Qiskit, Cirq, Pennylane, PyTorch, JAX

Publications

[1] **Apte, A.**, Ashmore, A., Córdova, C., Huang, T.-C., "Deep Learning Lattice Gauge Theories". In: *Forthcoming* (2024).

[2] **Apte, A.**, Córdova, C., Lam, H. T., "Obstructions to gapped phases from noninvertible symmetries". In: *Physical Review B* 108.4 (2023), p. 045134.

[3] De Prins, R., Yao, Y., **Apte, A.**, Miatto, F. M., "A Quadratic Speedup in the Optimization of Noisy Quantum Optical Circuits". In: *Quantum* 7.4 (2023), p. 1097.

[4] Kremenetski, V., **Apte, A.**, Hogg, T., Hadfield, S., Tubman, N. M., "Quantum Alternating Operator Ansatz (QAOA) beyond low depth with gradually changing unitaries". In: *arXiv preprint arXiv:2305.04455* 7.4 (2023), p. 1097.

[5] **Apte, A.**, Marwaha, K., Murugan, A., "Non-Convex Optimization by Hamiltonian Alternation". In: *arXiv preprint arXiv:2206.14072* 7.4 (2022), p. 1097.

[6] Liu, M., Liu, J., Liu, R., Makhanov, H., Lykov, D., **Apte, A.**, Alexeev, Y., "Embedding learning in hybrid quantum-classical neural networks". In: *2022 IEEE International Conference on Quantum Computing and Engineering (QCE)*. Vol. 7. 4. IEEE. Verein zur Forderung des Open Access Publizierens in den Quantenwissenschaften, 2022, pp. 79–86.

[7] Nguyen, T., Tsurimaki, Y., Pablo-Pedro, R., Bednik, G., Liu, T., **Apte, A.**, Andrejevic, N., Li, M., "Topological signatures in nodal semimetals through neutron scattering". In: *New Journal of Physics* 24.1 (2022), p. 013016.

[8] Nguyen, T., Han, F., Andrejevic, N., Pablo-Pedro, R., **Apte, A.**, Tsurimaki, Y., Ding, Z., Zhang, K., Alatas, A., Alp, E. E., "Topological singularity induced chiral Kohn anomaly in a Weyl semimetal". In: *Physical review letters* 124.23 (2020), p. 236401.

[9] **Apte, A.**, Hughes, S. A., "Exciting black hole modes via misaligned coalescences. I. Inspiral, transition, and plunge trajectories using a generalized Ori-Thorne procedure". In: *Physical Review D* 100.8 (2019), p. 084031.

[10] Hughes, S. A., **Apte, A.**, Khanna, G., Lim, H., "Learning about black hole binaries from their ringdown spectra". In: *Physical Review Letters* 123.16 (2019), p. 161101.

[11] Lim, H., Khanna, G., **Apte, A.**, Hughes, S. A., "Exciting black hole modes via misaligned coalescences. II. The mode content of late-time coalescence waveforms". In: *Physical Review D* 100.8 (2019), p. 084032.

Honors and Awards

- Awarded **Nambu Fellowship** for being the highest-rated applicant to the Ph.D. Program
- **Phi Beta Kappa** inductee from the Class of 2020 at Massachusetts Institute of Technology
- **Gold Medal** in Asian Physics Olympiad 2015 held in Hangzhou, China
- **Silver Medal** in International Physics Olympiad 2015 held in Mumbai, India
- Awarded **NTSE** Scholarship by the Human Resources Department, Government of India