Anuj Apte

📞 +1 (617) 949 0154 • ✉ apteanuj@uchicago.edu • 🏠 apteanuj.github.io • in apteanuj

Education

University of Chicago   **Chicago, IL**
Ph.D. in Physics   *2022–June 2025*
Research: Deep Learning, AI for Science

University of Chicago   **Chicago, IL**
M.S. in Physics   *2020–2022*
Relevant Coursework: ML for Molecular Modelling · Differential Geometry · Topology

Massachusetts Institute of Technology   **Cambridge, MA**
B.S. in Physics & Philosophy   *2016–2020*

Skills

Languages: Python, C++, CUDA   **Libraries**: JAX, PyTorch   **Tools**: Git, Slurm, AWS EC2

Work Experience

Department of Physics, University of Chicago   **Chicago, IL**
Graduate Research Fellow   *07/2020–Current*
- Developed Equivariant Convolutional Neural Networks using JAX, leading to state of the art performance for lattice quantum systems.
- Used Optax to train these models, leveraging Slurm for managing the runs on Midway supercomputer.
- Applied transfer learning to compute the phase diagram, showing for the very first time showed that critical exponents can be calculated to high accuracy.

Applied Research, JP Morgan Chase   **New York, NY**
Summer Research Associate   *06/2024–09/2024*
- Devised novel quantum algorithms for solving complex combinatorial optimization problems, using Chebyshev interpolation to achieve better performance in fewer circuit evaluations.
- Conducted large-scale parallelized GPU simulations of quantum algorithms on EC2 servers, optimizing resource allocation.

IBM Corporation   **Yorktown Heights, NY**
Research Intern   *05/2023–08/2023*
- Developed a deterministic technique for mitigation of measurement errors,leading to 10x reduction in measurement errors.
- Implemented Python code focusing on performance optimization and scalability to hundreds of qubits.
- Demonstrated the use of this method on the largest 433 qubit 'Osprey' quantum processor.

Xanadu Quantum Technologies   **Toronto, ON**
Research Resident   *05/2022–08/2022*
- Designed algorithm for faster simulations of Gaussian photonic circuits, achieving a quadratic speedup over state of the art.
- Wrote python software package implementing this algorithm while ensuring end-to-end differentiablity.
- Achieved 100x speedup in the circuit simulation for GKP qubit preparation.

Honors and Awards

2022: **Nambu Fellowship**, Highest-rated Ph.D. applicant, University of Chicago

2020: **Phi Beta Kappa**, Massachusetts Institute of Technology

2015: **Gold Medal**, Asian Physics Olympiad, Hangzhou, China

2015: **Silver Medal**, International Physics Olympiad, Mumbai, India

Selected Publications

[1]   **Apte, A.**, Ashmore, A., Cordova, C., Huang, T.-C., "Deep learning lattice gauge theories". In: *arXiv preprint arXiv:2405.14830* (2024).

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

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

[4]   Liu, M., Liu, J., Liu, R., Makhanov, H., Lykov, D., **Apte, A.**, Alexeev, Y., "Embedding learning in hybrid quantum-classical neural networks". In: *IEEE International Conference on Quantum Computing and Engineering (QCE)*. 2022.

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