Andrew Yates

www.andrewyates.me/cv/

Education

CORNELL UNIVERSITY
Bachelor of Arts in Physics, GPA: 4.01/4
Expected graduation: May 2022

- Selected coursework: Quantum Information Processing, Blackholes & Quantum Information (Grad), QFT (Grad), Quantum I-III, Solid State Physics, Applied Functional Analysis (Grad), Math Methods for Info Sci, Large Scale ML.

Research Experience

CALTECH INSTITUTE FOR QUANTUM INFORMATION AND MATTER
Advisor: John Preskill
April 2021 – present

- Supported by the Caltech Summer Undergraduate Research Fellowship.
- Gave a talk at the MURI Annual Meeting 2021: Quantum Codes, Tensor Networks, and Quantum Spacetime.
- Studied the effects of noise on 'quantum gravity in the lab' experiments. Using quantum information and random matrix theory, predicted unexpected noise-resilience caused by special operator-scrambling behavior. Currently developing a quantum error correction strategy that restores the teleported state to its noiseless form.

CORNELL UNIVERSITY
Advisors: Paul Ginsparg and Peter McMahon
August 2020 – March 2021

- Implemented a quantum algorithm to prepare thermofield double states of the Sachdev–Ye–Kitaev (SYK) model. This algorithm consists of the Jordan-Wigner transformation and an adiabatic, trotterized Hamiltonian simulation of SYK. Developed methods for measuring the von Neumann and Rényi entropies of such systems.

Advisor: Peter McMahon
October 2019 – present

- Created and simulated a circuit-model quantum reservoir ML algorithm. Discovered that it is equivalent to a dual classical neural network, where the layer size grows exponentially with its depth.

June – October 2019

- Simulated ‘noise-resilient quantum circuits’ which are ‘Markovian’ and ‘locally rapidly mixing’. Created methods to diagnose and catalogue circuits with these properties. Found tensor network descriptions of the same phenomena which provided elegant analytic tools.

January 2020 – present

- Mentors undergrads in Peter McMahon’s group who are working on two projects. First, to use quantum chaos theory to diagnose ‘vanishing gradient’ problems (e.g., barren plateaus) in machine learning. Second, to mitigate training noise on quantum devices performing machine learning tasks by applying classical transfer learning theory techniques.

Service and Leadership

- Mentors an undergraduate sub-team within Peter McMahon’s lab. Creates and supervises the projects, hosts journal clubs, and provides tutoring for new student researchers. For more information, see above.
- Mentors prospective students of physics and computer science, helping them find research opportunities and choose courses.

Skills

- Quantum computation, quantum information theory, and random matrix theory (i.e., unitary t-designs, Weingarten Calculus).
- Quantum simulation, quantum chaos theory, classical/quantum machine learning & linear algebra algorithms.
- Software packages: Cirq, Qiskit, Qutip, Pennylane, Tensorflow (Quantum), OpenFermion.

Industry Experience

CORNELL DESIGN & TECH INITIATIVE

January - May 2019

- Software developer for DTI, a prestigious engineering project team.

XIFIN, INC.

June - August 2017

- Software developer intern at a company which automates healthcare financial processing.