Guo (Jerry) Zheng

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Education

St. John's College, University of Oxford

M.A in Physics *2020 - 2021*

- Master's Project: Experimental quantum computing with ion trap. Supervisor: Prof. David Lucas.

B.A in Physics *2017 - 2020*

- First Class Distinction. Placed top 5% among around 200 physics major students

Academic Honors

Casperd Scholarship, *St. John's College, Oxford, United Kingdom* *2018, 2019, 2000*
IPHO Silver Medal, *International Physics Olympiad, Yogyakarta, Indonesia* *Jul. 2017*
USAMO Qualifier (Top 260), *United States of America Mathematical Olympiad* *Mar. 2017*
Captain of National Team of Canada, *International Young Physicists' Tournament* *Jul. 2016*

Research Experience

Department of Physics, Yale University, United States

Summer Research Intern, Supervisor: Prof. Steven Girvin *Apr. 2020 - Aug. 2020*

- Simulated the dynamics of one dimensional Hubbard model on multiple coupled oscillator-transmon systems using GRAPE algorithm from optimal control.
- Improved the performance of GRAPE in QuTip through including customized fidelity expressions, arbitrary initial pulse, etc. The fidelity of dynamics simulation increased from around 90% to 99.9%.
- Performed variational methods based on the improved GRAPE algorithm on the half-filled Hubbard model under weak hopping. The variational ground state reached an overlap of 99% with the ground state from diagonalization.

Department of Physics, University of Oxford, United Kingdom

Undergraduate Researcher, Supervisor: Prof. Alex Lvovsky *Jan. 2020 - Mar. 2020*

- Assembled from scratch the experiment setup for type I spontaneous parametric down-conversion (SPDC) with β-Barium Borate.
- Demonstrated entanglement and remote state preparation of the down-converted photons through statistically analyzing photon coincidence event counts.
- Reached 0.03 in the ratio of coincidence event counts to single-photon detection counts, which is around 50% higher than past literature. Produced a report and a comprehensive lab manual to convert the experiment to an advanced undergraduate-level teaching lab.

Department of Physics, University of California, Berkeley, United States

Summer Research Intern, Supervisor: Prof. Hartmut Haeffner *Aug. 2019 - Oct. 2019*

- Integrated a new readout camera with a high signal-to-noise ratio into the ion-trap setup. Wrote an interface between the camera's C++-based dynamic link library and the Python-based lab code base.
- Modeled the error sources in the state readout process. Compared readout algorithms based on data from segmented photomultiplier tubes to ones based on images from an electron-multiplying charge-coupled device (EMCCD).

Department of Chemistry, Princeton University, United States

International Student Internship Program, Supervisor: Prof. Herschel Rabitz *Jun. 2019 - Dec. 2019*

- Simulated dynamics of one dimensional Ising model under time-dependent transverse and longitudinal fields using Artificial Neural Networks (ANN) models such as Feed Forward Neural Network and Restricted Boltzmann Machine.
- Optimized the fidelity by initializing the parameters with ground states evolved from stochastic reconfiguration. Implemented Metropolis-Hastings algorithm based on Markov chains for stochastic sampling. Demonstrated the polynomial complexity of the ANN models compared to the exponential scaling of conventional numerical methods for up to 10 spins.

Department of Physics, Southern University of Science and Technology, China

Summer Research Intern, Supervisor: Prof. Yuanzhen Chen *Jun. 2018 - Jul. 2018*

- Researched on quantum computing algorithms and presented to the group on Shor's algorithm, Grover's algorithm, and HHL algorithm. Compared state-of-the-art proposals on quantum machine learning to classical machine learning.
- Expanded expressions for the Hamiltonian of transmon entanglements from two transmons to multiple ones and measured the experimental realizability by estimating the magnitude of interactions.

Other Experience

Technology Division, Deutsche Bank, United Kingdom

Spring Internship Program *Apr. 2019*

- Desk shadowed in Data, Global Transaction Banking Technology, and Fixed Income & Currencies divisions. Took part in coding challenges on data analysis and risk estimations.
- Understood the trading process and roles of the front, middle, and back offices through simulated trading in group activities.
- Was offered a position join as an intern in summer 2020 at the London office after on-site interviews.

Algorithms Team, iCarbonX, China

Summer Intern *Aug. 2018 - Sep. 2018*

- Modified Gibbs sampling algorithm for high dimensional combinatorial problems in dietary intake recommendation tasks. Increased performance for 50% in the testing stage while reaching an acceptable run time. The algorithm is now implemented for industrial usage.
- Analyzed periodic patterns in data extracted from online posts related to childcare with methods like FFT, correlation coefficient, etc. Applied NLP algorithms such as TF-IDF algorithm and TextRank algorithm for keywords extraction.

Talks

Quantum many-body dynamics simulation using ANN models

Invited Speaker, International Student Internship Program, Princeton University *Aug. 2019*

State-of-the-art experimental realizations of quantum computing

Invited Speaker, Physics Student Talks, University of Oxford *Feb. 2019*

Skills, Activities and Interests

Software Skills ***Language:*** Python, R, Matlab, Java, and C

Library: QuTip, ARTIQ, labRAD, Tensorflow, Qiskit

Sports ***Member,*** Oxford University Table Tennis Varsity Team

Captain, St. John's College Basketball Team

Society ***Junior Analyst,*** Oxford University Strategy Group Digital

Consultant, Oxford Student Consultancy