ZANE ROSSI

MIT PhD Student in Quantum Information

Education

MIT — Cambridge, MA
PhD Student, Physics · Matric. 2019
Focus in Quantum Information and TCS with Prof. Isaac Chuang.

The University of Chicago — Chicago, IL
B.S. Mathematics, B.A. Physics · 2019
GPA: 3.92 · (Major GPA: 4.00) · Mathematics & Physics (Honors), Creative Writing Minor

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Site: pedalferrous.com

Research Experience

MIT Quanta Group — Cambridge, MA — Aug 2019–Present

Derived query complexity bounds for quantum channel discrimination using quantum signal processing (QSP) methods. Proved exponential separation from problem's classical analogue.

Refactored Python package for computing instances of Hamiltonian simulation (QSP, Remez-type algorithm), and expanded implementation to the quantum singular value transform (QSVT).

UChicago Chong Lab — Chicago, IL — Dec 2017–Jun 2019

Designed pulse-shaping protocols for quantum optimal control using automatic differentiation in Google's TensorFlow, and authored proof-of-concept models of quantum compilation schemes for scheduling approximately error correcting superconducting circuits.

Modified previously existing 'QASM' benchmark tests to comply with internal API for use in quantum resource estimation for simulated circuits reusing dirty auxiliary qubits.

UTokyo Katsura Lab — Tokyo, JPN — Jun–Dec 2017

Derived novel entanglement metrics for MBL quantum spin systems exhibiting time-translation symmetry breaking using DMRG principles and a distinctly information-theoretic approach.

Implemented algorithms based in block-decimation method to reduce time for classical simulation of MBL systems under area-law assumptions. Drafted weekly lectures for undergraduate students at the University of Tokyo Hongo campus.

Publications

Quantum Hypothesis Testing for Non-Abelian Representations · With Professor I. Chuang · (*Under review, 2020*)

Optimized Compilation of Aggregated Instructions for Realistic Quantum Computers · With Professor F. Chong · (*ASPLOS, Jan. 2019*)

Analytic and Computational Investigations of Spontaneous TTSB in High Spin Systems · With Professor H. Katsura · (*Internal report, Jun. 2017*)

Fellowships & Awards

Fay and Walter Selove Prize (2018) · Stipend for research with University of Chicago professor awarded by department

University of Chicago Student Marshal and Phi Beta Kappa (2018) · Highest honor conferred to undergraduate students at the University of Chicago

FUTI Award (2017) · Stipend for research with Katsura group of the University of Tokyo, courtesy of Friends of UTokyo Inc. for use during the University of Tokyo Research Internship Program (UTRIP)

James Franck Institute Summer Fellowship (2016) · Stipend for research with University of Chicago professor sponsored by the James Franck Institute

Coursework

Mathematics · Real & Complex Analysis · Differential Equations · Abstract Algebra & Representation Theory · Complexity Theory · Computability Theory · Differential Geometry

Computer Science · Algorithms · Natural Language Processing · Modern Cryptography

Physics · Quantum Mechanics · General Relativity · Quantum Information and Algorithms · Quantum Field Theory · Exp. Quantum Computing

Technical Background

Development · Java · Python (& TensorFlow) · Mathematica · HTML/CSS/JS/Django · C · Haskell

Design · Adobe Suite (InDesign & Illustrator) · LaTeX

Language · Japanese (4+ years of study · high-intermediate)