❍ ZANE M. ROSSI

JSPS Postdoctoral Fellow at UTokyo working in the theory of quantum algorithms

Education

MIT — Cambridge, MA, USA
PhD, Physics · 2019–2024
Advised by Prof. Isaac Chuang.

The University of Chicago — Chicago, IL, USA
B.S. Mathematics, B.A. Physics (Honors) · 2019

Contact

Email: zmr@g.ecc.u-tokyo.ac.jp
Github: white-noise
Website: pedalferrous.github.io

Publications

[0] Singular value transformation for unknown quantum channels. R. Niwa, ZMR, P. Taranto, M. Murao.
(Under review, 2025: arXiv:2506.24112).

[1] A Solovay–Kitaev theorem for quantum signal processing. ZMR.
(Under review, 2025: arXiv:2505.05468).

[2] Unification of finite symmetries in simulation of many-body systems on quantum computers.
V. Bastidas, N. Fitzpatrick, K. Joven, ZMR, S. Islam, T. Van Voorhis, I. Chuang, Y. Liu.
(PRA, 2025: arXiv:2411.05058).

[3] Parallel quantum signal processing via polynomial factorization.
J. M. Martyn, ZMR, K. Z. Cheng, Y. Liu, I. L. Chuang.
(Under review, 2024: arXiv:2409.19043).

[4] Modular quantum signal processing in many variables. ZMR, J. Ceroni, I. Chuang.
(Quantum, 2023: arXiv:2309.16665). With associated codebase»

[5] Quantum signal processing with the one-dimensional quantum Ising model.
V. Bastidas, S. Zeytinoğlu, ZMR, I. Chuang, W. Munro.
(PRB, 2023: arXiv:2309.04538)

[6] Semantic embedding for quantum algorithms. ZMR, I. Chuang.
(J. Math. Phys., 2023: arXiv:2304.14392)

[7] Quantum signal processing with continuous variables. ZMR, V. Bastidas, W. Munro, I. Chuang.
(Under edits, 2023: arXiv:2304.14383)

[8] Multivariable quantum signal processing (M-QSP). ZMR, I. Chuang.
(Quantum, 2022: arXiv:2205.06261)

[9] A grand unification of quantum algorithms. J. Martyn, ZMR, A. Tan, I. Chuang.
(PRX Quantum, 2021: arXiv:2105.02859)

[10] Quantum advantage for noisy channel discrimination. ZMR, J. Yu, I. Chuang, S. Sugiura.
(PRA, 2021: arXiv:2105.08707)

[11] Quantum hypothesis testing with group structure. ZMR, I. Chuang.
(PRA, 2021: arXiv:2102.02194)

[12] Optimized compilation of aggregated instructions for realistic quantum computers. Y. Shi et al.
(*ASPLOS, Jan. 2019*: arXiv:1902.01474)

Research Experience

UTokyo Murao Group — Tokyo, JP — Aug 2024–Present
Derived new tools to characterize the functional properties of quantum ansätze relaxing the assumptions of QSP/QSVT for manipulating block encodings.

MIT Quanta Group — Cambridge, MA — Aug 2019–Aug 2024
Investigated formal properties of novel quantum algorithms extending quantum signal processing (QSP) and QSVT, with application to concrete statements of quantum advantage.

Lead contributor on packages» for numerical optimization over QSP and QSVT ansätze.

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

Designed pulse-shaping protocols for quantum control using Google's TensorFlow, modeling scheduling schemes for approximately error correcting circuits on superconducting devices.

UTokyo Katsura Group — Tokyo, JP Jun–Dec 2017

Derived novel entanglement metrics and authored numerical simulation packages for for MBL quantum spin systems exhibiting time-translation symmetry breaking using DMRG principles.

Fellowships, Internships & Awards

Oberwolfach Foundation Fellow for Arbeitsgemeinschaft 2441, Germany (October, 2024)

Japan Society for the Promotion of Science (JSPS) Postdoctoral Fellow at the University of Tokyo (August, 2024 – August, 2026)

Core participant, IPAM long program, UCLA (Fall, 2023)

Visiting researcher, NTT BRL, Japan (Fall, 2022)

Remote NTT PhD Research Internship (Summer, 2021, in US)

Fay and Walter Selove Prize (2018) · Stipend for summer research.

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

James Franck Institute Summer Fellowship (2016) · Stipend for summer research.

Talks & Posters

QTML 2025 (tutorial, invited), Singapore · QSP and QSVT. Nov, 2025.

AQIS 2025 (long talk, accepted), Hong Kong · A Solovay–Kitaev theorem for QSP. Aug, 2025.

Quantum Innovation 2025, Osaka · A Solovay–Kitaev theorem for QSP. July, 2025.

FU Berlin Learning Seminar · A Solovay–Kitaev theorem for QSP. Jun, 2025.

UC Berkeley Mathematics Seminar · A Solovay–Kitaev theorem for QSP. Mar, 2025.

QIP 2025, Raleign, NC, USA · Parallel quantum signal processing. Mar, 2025.

ISNTT 2024, Atsugi, JP · Parallel quantum signal processing. Dec, 2024.

QMQI 2024, Okinawa, JP · Parallel quantum signal processing. Nov, 2024.

Oberwolfach Arbeitsgemeinschaft, Germany · Multivariable quantum signal processing. Oct, 2024.

Tufts Quantum Seminar · Modular quantum signal processing with gadgets. Jun 6, 2024.

RPI 'rising stars' invited talk · Modular quantum signal processing with gadgets. Apr 5, 2024.

UTokyo invited seminar (Murao group) · QSP and QSVT essentials. Jan 26, 2024.

NTT BRL invited seminar · Modular quantum signal processing with gadgets. Jan 25, 2024.

UOsaka invited seminar (Fujii group) · Modular quantum signal processing with gadgets. Jan 23, 2023.

UCLA IPAM invited talk · Modular quantum signal processing with gadgets. Oct 03, 2023.

RIKEN seminar · Modularity and self-embedding in quantum algorithms. Nov 25, 2022.

University of Tokyo · Modularity and self-embedding in quantum algorithms. Oct 12, 2022.

NTT Basic Research Lab · Multivariable quantum signal processing. Sep 01, 2022.

C2QA Theory Meeting · Multivariable quantum signal processing. Jun 01, 2022.

C2QA IBM-MIT Meeting · Multivariable quantum signal processing. Mar 24, 2022.

Q2B Conference (invited) · A grand unification of quantum algorithms. Dec 7, 2021.

NTT Research · Multivariable quantum signal processing. Nov 29, 2021.

PsiQuantum (invited) · A grand unification of quantum algorithms. Jul 21, 2021.

APS March Meeting · A grand unification of quantum algorithms. Mar 15, 2021.

QIP 2021 (poster) · Quantum channel discrimination with group structure. Febr 04, 2021.

MIT QIS Group Meeting · Quantum channel discrimination with group structure. Mar 13, 2020.

Coursework & Teaching

Teaching · Undergraduate researcher supervisor (three students over summers of 2020, 2021, 2023, each resulting in publications) · TA, MIT 8.371, Introduction to Quantum Information, 2020

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

Computer Science · Algorithms · Natural Language Processing · Cryptography & interactive proofs

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

Technical Miscellany

Development · Python · Mathematica · Java · HTML/CSS/JS/Django · C · Haskell · LaTeX[††]

Language · Working proficiency Japanese (7+ years of study · JLPT 日本語能力試験 N2 合格)

[††]*This document was most recently compiled on July 18, 2025.*