Michael Ragone

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Profile and Objective

Actively working at the intersection of quantum information theory, computation, and many body physics. Pursuing internships with a bent towards analytic and rigorously provable theory work.

Education

University of California, Davis: Ph.D. Candidate Mathematics *(expected early 2024)*

Advisor: Bruno Nachtergaele

Proposal talk: Dimerized Spin Chains and SPT Phases of Quantum Matter (*abstract*)

- Investigating a class of SO(n)-invariant quantum spin chain ground states which exhibit dimerization. The paper (in preparation) will shed light upon:
    - Matrix product state/tensor network structure.
    - State symmetry properties and topological indices.
    - Various measures of entanglement, both analytically and numerically in Matlab.
- *(with Isaac Kim, UC Davis computer science)* Studying quantum mutual information and its relationship to the modular Hamiltonian.
- (*with Isaac Kim*) Exploring Haar-averaged performance of noisy circuits for NISQ circuits.

University of Arizona: B.S. Electrical and Computer Engineering *(2018)*

Experience

Geometric Quantum Machine Learning, LANL *(Summer 2022 - Present)*

Los Alamos National Laboratory, T-Division. Quantum Computing Summer School 2022

Advisors: Marco Cerezo and Patrick Coles

- **Paper 1**: a general framework for finite and Lie group-equivariant quantum neural networks and some provable demonstrations of performance improvements.
- **Paper 2**: an expository article on representation theory in quantum machine learning.
- Paper 3: (in preparation) numerical demonstration of performance improvements.

Mixed Classical-Quantum Simulation on a Quantum Computer, LANL *(Summer 2022)*

Advisor: Andrew Sornborger

- Worked on a NISQ-friendly paradigm for resource efficient quantum simulation of mixed classical-quantum systems which feature quantum "backreaction" in the classical system.
- Primarily analytic work accompanied by Matlab simulations.

Teaching *(Fall 2018 - Present)*

- Instructor, UC Davis: vector calculus Summer 2021
- TA, UC Davis: intro calculus sequence, linear algebra, differential equations, intro to proofs

Engineering Senior Design, General Dynamics and University of Arizona *(2017 - 2018)*

- Designed, implemented, and tested a full machine learning system for Coast Guard distress call de-noising.
- Primary roles in digital audio signal processing framework and neural network autoencoder design. Written in Python and Tensorflow.