



Michael Ragone

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Morrey Visiting Assistant Professor, Department of Mathematics

University of California Berkeley, CA

July 2024 - (ongoing)

Mentor: Lin Lin

Education

Ph.D. in Mathematics

University of California Davis, CA

Mar 2024

Advisor: Bruno Nachtergaele

Thesis: $SO(n)$ AKLT Chains as Symmetry Protected Topological Ground States

Bachelor of Science in Electrical and Computer Engineering

The University of Arizona, Tucson, AZ

May 2018

Publications

Publications

On the Metastability of the Mean-Field Interchange Model for Local Dimension ≥ 3 . *Sergio Escobar, Lin Lin, Michael Ragone, Kevin D. Stubbs*. ([arXiv:2610.01987](https://arxiv.org/abs/2610.01987))

Quantum Markov State Models for Metastable Dynamics. *Hao-En Li, Lin Lin, Michael Ragone*. ([arXiv:2609.40214](https://arxiv.org/abs/2609.40214))

Spectral Gap of the Davies Generator for the Mean-Field Heisenberg Model. *Joao Basso, Thiago Bergamaschi, Lin Lin, Michael Ragone, Kevin D. Stubbs*. ([arXiv:2607.21798](https://arxiv.org/abs/2607.21798))

The Many-Body Ground State Manifold of Flat Band Interacting Hamiltonian for Magic Angle Twisted Bilayer Graphene. *Kevin D. Stubbs, Michael Ragone, Allen MacDonald, Lin Lin*. *Commun. Math. Phys.*, **407**(11), 236 (2026) (2026).

$SO(n)$ AKLT Chains as Symmetry Protected Topological Quantum Ground States. *Michael Ragone*. *Doctoral Thesis*, 2024

A Lie Algebraic Theory of Barren Plateaus for Deep Parameterized Quantum Circuits. *Michael Ragone, Bojko N. Bakalov, Frederic Sauvage, Alexander F. Kemper, Carlos Ortiz Marrero, Martin Larocca, M. Cerezo*. *Nature Communications* 15 (1), 7172 (2024)

Theory for Equivariant Quantum Neural Networks. *Quynh T. Nguyen, Louis Schatzki, Paolo Braccia, Michael Ragone, Patrick J. Coles, Frederic Sauvage, Martin Larocca, M. Cerezo*. *PRX Quantum* 5 (2), 020328 (2024)

Quantum Neural Networks: Issues, Training, and Applications. *Carlos Ortiz Marrero, Nathan Wiebe, Jim Furches, Michael Ragone*. (internal PNNL publication 2023)

Representation Theory for Geometric Quantum Machine Learning. *Michael Ragone, Paolo Braccia, Quynh T. Nguyen, Louis Schatzki, Patrick J. Coles, Frederic Sauvage, Martin Larocca, M.Cerezo*. ([arxiv:2210.07980](https://arxiv.org/abs/2210.07980))

The Power of Equivariant Quantum Neural Networks *Paolo Braccia, Quynh T. Nguyen, Louis Schatzki, Michael Ragone, Patrick J. Coles, Frederic Sauvage, Martin Larocca, M.Cerezo*. (in preparation)

Previous Research Experience

Graduate Student Researcher, Representation Theory for Variational Quantum Algorithms

Pacific Northwest National Laboratory

Jun 2023 - Jan 2024

Advisors: Carlos Ortiz-Marrero and Bojko Bakalov (NC State University)

Graduate Student Researcher, Geometric Quantum Machine Learning

Los Alamos National Laboratory (T-Division)

Jun 2022 - Oct 2022

Advisors: Marco Cerezo and Patrick Coles

Graduate Student Researcher, Mixed Classical-Quantum Simulation on a Quantum Computer

Los Alamos National Laboratory (T-Division)

Jun 2022 - Oct 2022

Advisors: Andrew Sornborger

Engineering Senior Design, Electrical and Computer Engineering

University of Arizona, Tucson, AZ

Aug 2017 - May 2018

Corporate Sponsor: General Dynamics

Advisors: Elmer Grubbs and Gary Redford

Undergraduate Researcher, Undergraduate Biology Research Project (UBRP)

The University of Arizona, Tucson, AZ

May 2015 - Oct 2017

Advisors: Jean-Marc Fellous and Onur Ozan Koyluoglu

Undergraduate Researcher, Masaryk University Research Abroad Program

Advisor: Přemysl Lubal

Presentations and Workshops

(* indicates invited speaker, ^ indicates organizer)

- Simons Quantum Summer Cluster Final Workshop 2026, (Lightning Talks) *Spectral Gap of the Davies Generator of the Mean-Field Heisenberg Model*. ([July 20 - 24 2026](#))
- Siam Quantum Science and Technology (SQST) 2026, *Spectral Gap of the Davies Generator of the Mean-Field Heisenberg Model*. ([May 18 - 21 2026](#))
- New Frontiers in Quantum Algorithms for Open Quantum Systems, IPAM. *Spectral Gap of the Davies Generator of the Mean-Field Heisenberg Model*. ([Jan 12 - 16 2026](#))
- * Simons Moire Materials Workshop, Flatiron Institute. *The Many-Body Ground State Manifold of Flat Band Interacting Hamiltonian for Magic Angle Twisted Bilayer Graphene* ([May 30 - Jun 2 2025](#))
- ^ Joint Mathematics Meeting 2025, AMS Special Session on Variational Methods in Quantum Computing. Co-organized with Carlos Ortiz Marrero and Jason Saied. ([Jan 8-11 2025](#))
- Joint Mathematics Meeting 2025, AMS Special Session on Mathematics of Topological Insulators. *SO(n) AKLT Chains as Symmetry Protected Topological Quantum Ground States*. ([Jan 8-11 2025](#))
- * CIQC Spark Talk, UC Berkeley, *The Unclear State of Quantum Machine Learning* ([Nov 15 2024](#))
- * BIMSA TQFT and Higher Symmetries Seminar, *The Curious Symmetry Breaking of SO(n) AKLT chains* ([Oct 21 2024](#))
- * Invited Talk, 2024, NASA Ames Research Laboratory. *Unified Theory of Barren Plateaus for Deep Parameterized Quantum Circuits*. ([Feb 6 2024](#))
- Quantum Information Processing 2024, Taipei International Convention Center. *Unified Theory of Barren Plateaus for Deep Parameterized Quantum Circuits*. ([Jan 13-19 2024](#))
- IPAM Workshop II: Mathematical Aspects of Quantum Learning, University of California Los Angeles. *Unified Theory of Barren Plateaus for Deep Parameterized Quantum Circuits*. ([Oct 16-20 2023](#))
- * 2023 NC State Quantum Workshop, North Carolina State University. *Representation Theory for Geometric Quantum Machine Learning*. ([Jan 2023](#))
- *Curious Dimerization in a Class of SO(n)-invariant Matrix Product States* ([Aug - Sep 2022](#))
 - Erwin Schrödinger Institute at University of Vienna. Tensor Network based approaches to Quantum Many-Body Systems ([Sep 5-9 2022](#))
 - Technische Universität München. IAMP EMS Summer School in Mathematical Physics ([Aug 29 - Sep 2 2022](#))
- Quantum Computing Summer School, Los Alamos National Laboratory. *Mixed Classical-Quantum Simulation on a Quantum Computer* ([Aug 2022](#))
- * Student-Run Research Seminar, UC Davis. *Solids, Liquids, and Topological Insulators: Symmetry Protected Topological (SPT) Phases of Quantum Matter* ([Jun 2021](#))

- Quantum Lattice Seminar, UC Davis. *An Overview of the AKLT Model*. ([Jun 2020](#))
- Engineering Senior Design, University of Arizona. *Advanced Voice Filtering for R21 Using Machine Learning* ([May 2018](#))
- Society for Neuroscience 2016, *A Model of Path-encoding by Hippocampal Place Cells as a Possible Neural Basis of Approximations to the Traveling Salesperson Problem* ([Nov 2016](#))

Teaching Experience

Morrey Visiting Assistant Professor, UC Berkeley (*Fall 2024 - ongoing*)

Taught multiple iterations of MAT 185 and 185H (Complex analysis and Honors complex analysis) and MAT 121A (Mathematical methods for physicists). Faculty sponsor for students in MAT 199 and 197 (independent study and field study).

Graduate Professor, UC Davis (*Summer 2021*)

Taught vector calculus (MAT 21D) online Summer Session II 2021. Constructed lecture notes and course materials ([available online](#)), wrote exams and homework sets, and held regular office hours.

Teaching Assistant, UC Davis (*Fall 2018 - Spring 2024*)

Designed and organized discussion sections, graded exams, and held regular office hours for the following classes:

- Intro calculus (MAT 21A-21D)
- Differential equations (MAT 22B)
- Proof-based linear algebra (MAT 67)
- Real analysis (MAT 127B and 127C)

Tutor, Mt. Tamalpais Community College, San Quentin State Prison (*Winter 2023*)

Volunteer tutored college algebra, intro to statistics, vector calculus and linear algebra.

Tutor, Strategic Alternative Learning Techniques Center, University of Arizona (*2017 - 2018*)

Tutored math and science for college students with various learning disabilities, including ADHD, autism, Aspergers, dyslexia, and dyscalculia.

Mentoring and Service

Reviewing Duties

Reviewer for the journals Physical Review Letters and Quantum, and the conference Theory for Quantum Computation, Communication, and Cryptography.

Math 197 Field Study (*Fall 2026*)

Faculty sponsor for Zhen Gao in field study with Descartes Learning Club Corporation.

Quantum Information Theory Reading Group (*Spring 2026 - present*)

Overseeing weekly reading group on quantum computation with students Cass Bigler, Walter Cheng, and Mark Keller.

Math 199 Independent Research (*Fall 2025*)

Faculty sponsor for Mohammed Al Rashid for a project on Geometric Deep Learning.

Lie Theory Reading Group (*Summer 2025-present*)

Overseeing weekly reading group on Lie Theory with students Walter Cheng, Cameron Virgin, and Vignesh Nydhruva.

Quantum Computation Reading Group (*Spring 2025*)

Overseeing weekly reading group on quantum computation and information with students Jakob Bueller, Alex Frantzis, Jane Park, and John Wahlemeier.

Directed Reading Program (*2021 - 2024*)

Mentored multiple advanced undergraduate students in various mathematics topics. Alumni include Saud Moalib (quantum spin systems), Jiaxin Lu (graph theory), Ian Chi (differential geometry and Lie theory), and Arthur Jiang (Lie theory)

Graduate Pairing (*2020 - 2024*)

Paired with graduate mathematics students Brian Knight and Daniel Qin.

Quarterly Finals Tutoring Spree (*2018 - 2020*)

Volunteer tutored every quarter for massive finals study session.

Ms. Tran's Guest Speaker (*2020*)

Organized lesson on algebraic coding theory for low-income middle school students in San Jose for Ms. Meagan Tran's class.

Davis Math Circle (*2019*)

Organized lesson on algebraic coding theory for advanced middle and high school students in Davis area. [*link to lesson*](#)

SARSEF Science Fair (*2018*)

Volunteer judged at the Southern Arizona Research, Science, and Engineering Foundation (SARSEF) science fair.

UBRP Ambassador (*2015 - 2017*)

Member of Undergraduate Biology Research Program (UBRP) ambassadors. Organized regular outreach, community events, and volunteering events within Tucson. Head of science cafe, wherein interdisciplinary students met biweekly to discuss modern research.

Thesis Thursday KXCI (*2016*)

Radio interview with KXCI in Tucson discussing hippocampal place cell research with layman audience. [*link to interview*](#)

References Available Upon Request
