

Curriculum Vitae

Matthew Corbelli
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Education

PhD in Mathematics, June 2025

University of California, Davis

Dissertation: *Braided Tensor Categories Describing Anyons in Quantum Lattice Systems: Symmetries, Fermions, and the Fractional Quantum Hall Effect*

Master of Science in Mathematics

University of California, Davis

Bachelor of Science in Mathematics (with a minor in Computer Science)

University of California, Davis

Research Experience

- **Fractional Quantum Hall Effect (FQHE):**

- Collaborated with M. Fraas, S. Bachmann, and Y. Ogata to establish an upper bound for the Hall conductance denominator in infinite lattice systems, linked to the number of inequivalent simple objects in the associated category.

- **Symmetry in Lattice Systems:**

- Extended Ogata’s version of a construction of a braided C^* -tensor category for a lattice system to incorporate requirements of compatibility with on-site symmetries and anticommuting Fermion-like operators.
- Modified Naaijken’s (2022) theorem to show that imposing certain symmetry requirements leads to the sectors of product states system being classified by the Pontryagin dual of the symmetry group, instead of having a trivial sector theory.

- **Computational Complexity:** Defined a new complexity class for multi-player team games (in collaboration with D. Tobias and S. Dutta) and demonstrated that this class contains Δ_2EXP .

Publications

Sven Bachmann, Matthew Corbelli, Martin Fraas, and Yoshiko Ogata. *Tensor Category Describing Anyons in the Quantum Hall Effect and Quantization of Conductance*. *Reviews in Mathematical Physics* (2025), DOI: [10.1142/S0129055X24610075](https://doi.org/10.1142/S0129055X24610075). Also available as [arXiv:2410.04736](https://arxiv.org/abs/2410.04736).

Matthew Corbelli. *On Symmetry-Compatible Superselection Structures for Product States in 2D Quantum Spin Systems*. Preprint, [arXiv:2510.23790](https://arxiv.org/abs/2510.23790).

Skills and Interests

- C^* -algebras and their representations
- Quantum lattice systems
- Anyons in lattice systems
- Fractional quantum Hall effect and its anyon braiding statistics
- Symmetries in quantum systems
- Category theory, especially braided tensor categories
- Computational complexity classes related to games (e.g. RG, MIP)

Collaborators and Affiliations

Martin Fraas, Sven Bachman and Yoshiko Ogata - quantum lattice systems with anyons, FQHE
Greg Kuperberg, Sanchayan Dutta, Daniel Tobias - computational complexity

Teaching Experience

Graduate teaching assistant, UC Davis

Led discussion sections, administered exams and quizzes, graded assignments, and held office hours for undergraduate calculus courses.