Fernando Liu Lopez

(305) 323-8060
2818 Eagle Street, Houston, TX, 77004.
Email | LinkedIn | Github | Personal Webpage

SUMMARY

PhD Candidate in Mathematics at Rice University, specializing in noncommutative, categorical, and quantum algebra, with strong experience in data science and machine learning. Proven record of high-quality teaching, research, and collaborative project leadership.

EDUCATION

Rice University, Houston, TX
- Ph.D. Candidate in Mathematics – expected 2025-2026
- GPA: 3.98
- Dissertation: Twisting Systems in Closed Monoidal Categories
- Advisor: Chelsea Walton

Amherst College, Amherst, MA
- B.A. in Mathematics and Philosophy – 2018
- GPA: 3.89
- Honors: magna cum laude
- Senior Thesis: Coxeter Groups from a Combinatorial and Geometric Perspective
- Advisor: Yusra Naqvi

RESEARCH AND TEACHING EXPERIENCE

Doctoral Researcher – Rice University, Houston, TX – 2020-present
- Research Interests: Category Theory, Non-commutative algebra, Tensor Categories, Quantum algebra, Hopf Algebras, Representation Theory, TQFTs.
- Conducted research in quantum algebra and category theory, focusing on generalizing classical deformation techniques to modern settings.

Instructor of Record – Rice University, Houston, TX – 2022-2024
- Taught three sections of Ordinary Differential Equations and Linear Algebra (Summer 2022, Fall 2022, Spring 2024), with full responsibility for lectures, curriculum design, and overseeing graders.
- Received multiple awards for exceptional teaching skills.

Teaching Assistant – Rice University, Houston, TX – 2020-2024
- Held in-person and virtual office hours and recitations.
- Assisted in teaching Calculus I-III, Honors Linear Algebra, Abstract Algebra, Graduate Algebra, etc.

Quantitative Fellow – Amherst College, Amherst, MA – 2018-2019
- Provided personalized tutoring for upper division math courses including Linear Algebra, Abstract Algebra, Number Theory, Real Analysis, p-adic Analysis, and Galois Theory.
- Record attendance and performance reviews used to guarantee funding for subsequent years.

CODING SKILLS & CERTIFICATIONS

- Programming: Python, SQL, LaTeX, Github, Microsoft Office, Tableau, Power BI
- Libraries: numpy, scipy, pandas, scikitlearn, matplotlib, XGBoost, PyTorch, SHAP.
- Deployment: streamlit, Containerization (Docker), Cloud environments (AWS SageMaker).
- Quantitative: Linear Algebra, Statistics, Probability, Algorithms, ML, Time Series Analysis, Deep Learning.
- Soft Skills: collaboration, pattern recognition, creative thinking, problem solving, public speaking.
- Certifications:
  - The Erdős Institute Data Science [CERTIFICATION 1], [CERTIFICATION 2].
  - The Erdős Institute Deep Learning.

INDUSTRY PROJECTS

The Erdős Institute – TotallyMakesScents – May - July 2025

- [APP], [SLIDES], [EXECUTIVE SUMMARY], [GITHUB]
- Project Description: Developed a perfume recommender system capable of generating recommendations from user queries.
- Created web scraping tools and training data for continued pre-training and fine-tuning of LLMs.
- Created app and recommendation interface through Streamlit, app logo, and dashboards through Tableau for data analysis.

The Erdős Institute – Grocery store sales prediction – October - December 2024

- [VIDEO], [SLIDES], [EXECUTIVE SUMMARY], [GITHUB]
- Project Description: Analyzed data from Corporacion Favorita grocery stores to identify trends and construct predictive models for sales forecasting.
- Managed my team's workflow to ensure delivery of a viable product within a very strict timeframe.
- Combined my team's mathematical and data analytic findings to fine-tune an ensemble model best suited for the project's KPIs. Improved model performance by 20%, earning a spot in a Kaggle top 100 leaderboard.

The Erdős Institute – If You're Single…You're Probably a Democrat – May - June 2024

- [LINK], [SLIDES], [EXECUTIVE SUMMARY], [GITHUB]
- Project Description: Analyze county-level demographic and electoral data to establish how voter demographics contribute to voting behavior.
- Singlehandedly found, merged, and cleaned data from multiple sources to construct a dataset suited for inference within a very short timeframe.

PUBLICATIONS

Twists of graded algebras in monoidal categories – *Journal of Algebra, Volume 661* [LINK]
Generalized tools for deforming graded algebras to the setting of closed-monoidal categories.

AWARDS AND HONORS

- Graduate Teaching Award for Independent Instruction, Rice University, 2024.
  Developed by the CTE, Graduate Teaching Awards recognize graduate students who excelled at supporting undergraduate teaching at Rice as instructors of record and teaching assistants. The winners are selected based on their teaching philosophy, use of research-based methods and contribution to student learning.

- Excellence in Teaching Award, Department of Mathematics, Rice University, 2023.

  Fernando's teaching responsibilities span various roles and have been performed at the highest of standards. He has been the instructor of record for Math 211 (Differential Equations) twice, achieving an average Instructor Effectiveness score of 1.11 (out of 5, with 1 high). One comment from his evaluations states that: "[he] is absolutely outstanding [and] is one of the best math instructors [the student has] ever had. Taking this course with him really reminded [them] why [they] love math." His lectures are impeccably organized, and delivered as art-- a truly engaging experience for students. In addition, Fernando was the primary organizer for a learning group on 2-dimensional Topological Quantum Field Theories in Fall 2022, and presented several excellent lectures for the audience. Fernando is also known as a leader amongst the graduate students for supplying materials and assistance for qualifying exam preparation and for course instruction. And as an upcoming 4th year graduate student, he is only getting started. Fernando Liu Lopez is a naturally gifted communicator, and has a bright future introducing all kinds of students to the wonderful world of mathematics.

CONFERENCE PRESENTATIONS AND TALKS

- *Twists of graded algebras in monoidal categories*, AMS Special Session on Recent Developments in Noncommutative Algebra and Tensor Categories, Washington DC, April 2024. [SLIDES]

- *Zhang Twists in Monoidal Categories*, Joint Mathematics Meeting, Special Session in Homological Techniques in Noncommutative Algebra, San Franscico, January 2024. [SLIDES]

CONFERENCES

- *Categorical Symmetries in Quantum Field Theory*, Les Diablerets Switzerland, September 2023.
- *Physical Mathematics of Quantum Field Theory,* University of Massachusetts, Amherst, July 2023.
- *Research School on Bicategories, Categorification and Quantum Theory*, University of Leeds, July 2022.