Miguel Ricardo Lopez

He/Him/His

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Education

University of Pennsylvania — Philadelphia, PA
PhD Candidate: Applied Math and Computational Science — *Aug 2020 - Present*

- Fontaine Fellow
- Advisor: Dr. Robert Ghrist
- Research area: Applied Topology

Boston University — Boston, MA
Bachelor of Science: Mathematics — *Jan 2017 - May 2019*

- *Summa Cum Laude*
- GPA: 3.88

Suffolk University — Boston, MA
Major: Mathematics — *Aug 2015 - Dec 2016*

- GPA: 4.00

Research Experience

- **Network Sheaves for Opinion Dynamics**:
  - Constructed models of lattice valued sheaves over networks for use in opinion dynamics.
  - Invited to present at Socio-Math Workshop in Arlington, VA. *April 11-12, 2022*
  - Built Fuzzy Lattice model in Python.

- **NASA Goddard Space Flight Center**: SIP Intern for Higher Math in Satellite Communication
  - Used network sheaves to formalize and study time-varying graphs for use in satellite communications.
  - Research team had two extended abstracts accepted to the IEEE aerospace conference 2023.
  - Presented research results at NASA Goddard Space Flight Center.

- **London Geometry and Machine Learning (LOGML)**: PDE-inspired Sheaf Neural Networks led by Cristian Bodnar.
  - Participated in the LOGML research week for a project on sheaf neural networks. *July 11-15, 2022*
  - Created *Surfing on the Neural Sheaf* poster joint with Julian Suk, Lorenzo Giusti, Tamir Hemo, Konstantinos Barmpas, Cristian Bodnar.
  - Accepted to the *NeurIPS 2022 Workshop on Symmetry and Geometry in Neural Representations.*

- **The Adjoint School 2022**: A Compositional Theory of Timed and Probabilistic Processes
  - Attended research week at University of Strathclyde in Glasgow, Scotland. *July 11-15, 2022*
  - Extended abstract *Cyclic Causal Networks via Partial Markov Categories* submitted to Symposium on Compositional Structures (SYCO9) joint with Siddharth Bhat, Elena Di Lavore, Pim de Haan, Mario Román, Nicoletta Sabadini, and Ruben Van Belle..
  - Published a blog post joint with Ruben Van Belle on compositional Markov processes on the n-Category Cafe.

- **AMS Math Research Communities 2022**: Models and Methods for Sparse (Hyper)Network Science
  - Participated in a week long research retreat at the Beaver Hollow Conference Center in Java Center, NY. *June 5-11, 2022*

- Completed research in finding tractable approaches to modelling edge dependent hypergraph random walks.

- **Combinatorics of k-Farey Graphs**: Research project from the 2018 ICERM REU at Brown University.
  - Investigated topological proprieties of graph relating to curve system.
  - Publication: *Combinatorics of k-Farey Graphs*, Jonah Gaster, Miguel Lopez, Emily Rexer, Zoë Riell, Yang Xiao, Rocky Mountain Journal of Mathematics, Rocky Mountain J. Math. 50(1), 135-151, (February 2020)
  - Presented at the Joint Mathematics Meeting 2019 poster session. Received MAA Mathfest Outstanding Presentation Award.
  - Presented at Underrepresented Students in Topology & Algebra Research Symposium (USTARS) poster session.

Teaching Experience and Other Skills

- **Directed Reading Program** — Philadelphia, PA
  Mentor for the following projects:
  - James Blume, *Topology of Word Embeddings* — *Fall 2022*
  - Mason Larkin, *Applications of TDA to the Detection of Bifurcations* — *Spring 2022*
  - Joshua Ibrahim, *Topological Data Analysis and Persistent Homology* — *Fall 2021*

- **Mathnasium of Brookline** — Boston, MA
  Math Instructor — *Sept 2019 - July 2020*
  Instructed small groups of students from grades 2–12 on tailored math curriculum for 20-25 hours a week. Graded student work and reported progress each session with detailed notes for parents.

- **Programming Languages**
  Proficient in:
  - **Python.** Relevant coursework:
    - *CS 111: Intro to Computer Science I (Boston Univ.)*
    - *CIS 580: Machine Perception (Univ. of Penn.)*
    - *ESE 5140: Graph Neural Networks (Univ. of Penn.)*
  - **Java.** Relevant coursework:
    - *CS 112: Intro to Computer Science II (Boston Univ.)*
  - **MATLAB.** Relevant coursework:
    - *ENM 522: Numerical Methods for PDEs (Univ. of Penn.)*
  - **R.** Relevant coursework:
    - *MA 575: Linear Models (Boston Univ.)*
    - *STAT 9270: Bayesian Statistics (Univ. of Penn.)*
  - **D3.js.**

- **Teaching Assistant** — Philadelphia, PA
  University of Pennsylvania — *Fall 2021*
  - Math 810: Video Production for Mathematics. Required proficiency in:
    Microsoft Powerpoint, Maxon Cinema 4D, Adobe Premier Pro, Adobe Audition.

- **Course Grader** — Boston, MA
  Boston University
  - MA 123S: Calculus I — *Summer 2018*

- MA 511: Intro to Analysis I *Fall 2018*
- MA 512: Intro to Analysis II *Spring 2019*

- **Course Grader** Philadelphia, PA
  University of Pennsylvania
  - AMCS 6025: Numerical Linear Algebra *Fall 2022*
  - MATH 3200: Computer Methods in Mathematical Science I *Fall 2022*

Presentations and Research Talks

- **NASA Goddard Space Flight Center** Washington D.C.
  Lattices and Sheaves for Satellite Communications *August 2023*
- **USTARS** Seattle, WA
  Cellular Sheaves of Lattices *March 2023*
- **Socio-Math Workshop** Arlington, VA
  Residuated Lattices for Social Information *April 2022*
- **Univ. of Penn. Graduate Mathematics Seminar** Philadelphia, PA
  Fast Multiplication and Fourier Transforms *Fall 2022*

References

Available upon request.