Miguel Ricardo Lopez

He/Him/His

Email: mlopez3@sas.upenn.edu
Github: github.com/mlopez3
Website: upenn.edu/miguellopez

Education

University of Pennsylvania — Philadelphia, PA
PhD Candidate in 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, 3.88 GPA — *Jan 2017 - May 2019*
Summa Cum Laude

Suffolk University — Boston, MA
Major: Mathematics, 4.00 GPA — *Aug 2015 - Dec 2016*

Research Interests

Applied topology. Theory an applications of cellular sheaves, lattices, and category theory. Special emphasis on applications for formal concept analysis.

Papers and Publications

- *Equivariant Cosheaves and Finite Group Representations in Graphic Statics.* Joint with Z. Cooperband and B. Schulze. 2023. Preprint available at arXiv:2401.09392. *Submitted.*
- *Multi-domain routing in Delay Tolerant Networks.* Joint with O. Chiriac, S. Gopalakrishnan, J. Hwang, A. Hylton, B. Mallery, T. Rask, M. Ronnenberg. Accepted to IEEE Aerospace Conference 2024.
- *A Proposed Clock Synchronization Method for the Solar System Internet.* Joint with O. Chiriac, J. Cleveland, J. Curry, J. Hwang, A. Hylton, R. Kassouf-Short, M. Moy, M. Ronnenberg. Accepted to IEEE Aerospace Conference 2024.
- *Surfing on the Nerual Sheaf.* Joint with J. Suk, L.Giusti, T. Hemo, K. Barmpas, C. Bodnar. Accepted to NeurIPS 2022 Workshop on Symmetry and Geometry in Neural Representations.
- *Compositional Constructions of Automata.* Joint with R. Belle. 2022. Available on The n-Category Cafe.
- *Combinatorics of k-Farey Graphs.* Joint with J. Gaster, E. Rexer, Z. Riell, Y. Xiao. 2020. *Rocky Mountain Journal of Mathematics*, 50(1), pp. 135–151. Available at arXiv:1810.09011.

Research Experience

- **NASA Goddard Space Flight Center**: Summer 2023
  - *SIP Intern for Higher Math in Satellite Communication* online
- **London Geometry and Machine Learning (LOGML)**: July 11-15, 2022
  - *Researcher on PDE-inspired sheaf neural networks* online
- **The Adjoint School 2022 at the University of Strathcylde**: July 11-15, 2022
  - *Researcher on a Compositional Theory of Timed and Probabilistic Processes* Glasglow, Scotland
- **AMS Math Research Communities 2022**: June 5-11, 2022
  - *Researcher on Models and Methods for Sparse (Hyper)Network Science* Java Center, NY
- **ICERM REU at Brown University**: Summer 2018
  - *Researcher on Combinatorics of k-Farey Graphs* Providence, RI

Teaching Experience

- **Directed Reading Program** — Philadelphia, PA
  Mentor for the following projects:
  - Ling Xu, *Cellular Sheaf Theory and Applications in Robotics* — *Fall 2023*
  - 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.

- **Teaching Assistant/Course Grader** — Philadelphia, PA
  University of Pennsylvania
  - AMCS 6025: Numerical Linear Algebra — *Fall 2022*
  - MATH 3200: Computer Methods in Mathematical Science I — *Fall 2022*
  - Math 810: Video Production for Mathematics. Required proficiency in: Microsoft Powerpoint, Maxon Cinema 4D, Adobe Premier Pro, Adobe Audition. — *Fall 2021*

- **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*

Presentations and Research Talks

- **MSU Graduate Student Topology & Geometry Conference** — East Lansing, MI
  Network sheaves for relational data — *April 2024*
- **AMS Sectional Meeting on Topological Data Analysis** — Tallahassee, FL
  Network sheaves for relational data — *March 2024*
- **University of Wisconsin Milwaukee Topology Seminar** — Online
  Cellular Sheaf Theory — *October 2023*
- **NASA Goddard Space Flight Center** — Washington D.C.
  Lattices and Sheaves for Satellite Communications — *August 2023*
- **Underrepresented Students in Topology and Algebra Research Symposium** — Seattle, WA
  Cellular Sheaves of Lattices — *March 2023*
- **Socio-Math Workshop** — Arlington, VA
  Residuated Lattices for Social Information — *April 2022*
- **University of Pennsylvania Graduate Mathematics Seminar** — Philadelphia, PA
  Fast Multiplication and Fourier Transforms — *October 2022*
- **Underrepresented Students in Topology & Algebra Research Symposium** — Johnson County, IA
  Combinatorics of k-Farey Graphs (poster) — *2019*
- **Joint Mathematics Meeting** — Baltimore, MD
  Combinatorics of k-Farey Graphs (poster) — *January 2019*
  - Recieved MAA MathFest Outstanding Presentation Award

Programming Languages

- **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.)*
- **Javascript and D3.js.** Relevant projects:
  - *Distributive Lattice Visualizer blog post available at upenn.edu/miguellopez*

References

Available upon request.