

# Patricia Sorya

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## Education

- 2021 – 2025 **Doctor of Philosophy (candidate)**, *Pure mathematics*, Université du Québec à Montréal (UQAM), Montreal.
- 2019 – 2021 **Master of Science**, *Pure mathematics*, UQAM, Montreal.
- 2016 – 2019 **Bachelor of Science**, *Pure mathematics*, UQAM, Montreal.
- 2005 – 2010 **Doctor of Optometry**, Université de Montréal (UdeM), Montreal.

## Research interests

Low dimensional topology  
Knot theory  
Topological data analysis

## Publications

- Sorya, Patricia.** *Characterizing slopes for satellite knots.* Advances in Mathematics, vol. 450 (2024) <https://doi.org/10.1016/j.aim.2024.109746>
- Nissan R, Chevrefils C, **Sorya P**, et al. *Retinal phenotyping using spatial-spectral features derived from hyperspectral imaging.* Invest. Ophthalmol. Vis. Sci., vol. 65, 5953 (2024)
- Sylvestre JP, Arbour JD, Rhéaume MA, Nissan R, Rojewski A, **Sorya P**, et al. *Evaluation of geographic atrophy, nascent geographic atrophy, and hyperreflective foci with hyperspectral retinal imaging.* Invest. Ophthalmol. Vis. Sci., vol. 65, 5953 (2024)
- Nassar K, Niessen H, Arbour JD, Rhéaume MA, Nissan R, Rojewski A, **Sorya P**, et al. *Spatial-spectral characterization and mapping of labeled drusenoid deposits in non-neovascular age-related macular degeneration.* Invest. Ophthalmol. Vis. Sci., vol. 65, 5953 (2024)
- Submitted **Sorya, Patricia** and Wakelin, Laura. *Effective bounds on characterising slopes for all knots.* arXiv:2410.24209 (2024) (submitted to Trans. Amer. Math. Soc.)
- In preparation **Sorya, Patricia.** *Computing the Knot Floer complex of low thickness knots.*

## Talks and conferences

- Invited speaker **Bounding non-integral non-characterizing Dehn surgeries.**
- Topology seminar, Stanford University, Stanford, April 2025
  - CIRGET Geometry and Topology seminar, UQAM, Montreal, January 2025
  - Topology seminar, Princeton University, Princeton, December 2024
  - Topology seminar, Georgia Institute of Technology, Atlanta, December 2024
  - Topology seminar, McMaster University, Hamilton, November 2024
  - Geometry and Topology seminar, University of Ottawa, Ottawa, November 2024
  - Geometry, Topology and Dynamics seminar, Boston College, September 2024
- Non-integral Dehn surgeries characterize composite knots.**
- Topology seminar, McMaster University, Hamilton, November 2024
  - Topology seminar, Dartmouth College, Hanover, September 2024
  - Topology seminar, Max Planck Institute for Mathematics, Bonn, July 2024
- A family of knots whose characterizing Dehn surgeries are the non-integral ones,** *Topology seminar*, University of Texas, Austin, October 2024.
- Characterizing slopes : Explicit bounds for satellite knots,** *Summer meeting of the Canadian Mathematical Society*, Ottawa, June 2023.
- Topological data analysis for data scientists: homology,** *Journal club of the Artificial Intelligence team*, Optina Diagnostics, Montreal, June 2023.
- Characterizing slopes for satellite knots,** *Winter meeting of the Canadian Mathematical Society*, Toronto, december 2022.
- Obstructions to the triangulation of manifolds,** *Geometric Topology Grad and Postdoc Seminar*, Standford University (online), February 2022.
- Speaker **Knot Floer complex and characterizing Dehn surgeries of knots of thickness  $\leq 2$ ,** *New structures in low-dimensional topology*, Budapest, July 2024.
- Classification of hyperspectral image data using persistence landscapes,** *Applications of Representation Theory in Topological Data Analysis & Geometric Invariant Theory*, Montreal, June 2024.
- Characterizing Dehn surgeries and composite knots,** *Colloque panquébécois de l'Institut des sciences mathématiques*, Sherbrooke, June 2023.
- Small hyperbolic links?,** *Groups Around 3-Manifolds*, Montreal, June 2023.
- The Optina Diagnostics' Retinal Phenotyping Platform,** *20<sup>e</sup> Journée scientifique de l'École d'optométrie de l'Université de Montréal*, Montreal, March 2023.
- Characterizing slopes for satellite knots,** *Winter school in singularities and low dimensional topology*, Budapest, January 2023.

Working groups **Speaker and attendee**, *Low dimensional topology working group of the CIRGET*, Montreal, 2019 – current.

Talks given:

- Computing the knot Floer complex, February-March 2025
- Explicit characterising slopes for all knots!, August 2024
- Intersection graphs and reducible fillings, February 2024
- Characterizing slopes for satellite knots, May 2023
- Signature of knots, April 2022
- A cross homomorphism for the Laudénbach exact sequence, February 2021
- Cyclic covers of knot complements, September 2020

**Speaker, attendee and organizer (rotating)**, *CIRGET Topology students reading group*, Montreal, 2021 – current.

Talks given:

- Introduction to the volume conjecture, February-March 2025
- Knot Floer homology, October 2023
- Dehn surgery, the fundamental group and  $SU(2)$ , after Kronheimer and Mrowka, June 2023
- A-polynomial: examples and properties, April 2023
- Character varieties: Culler-Shalen seminorms, February 2023
- Character varieties: ideal points and valuations, November 2022
- Character varieties: tree graphs and surfaces in 3-manifolds, October 2022
- Bordered Heegaard Floer homology (continued), October 2022
- Bordered Heegaard diagrams and their associated strands algebra, August 2022
- Twisted Alexander invariants, July 2022
- Heegaard Floer homology, fall 2021

**Speaker and attendee**, *Topological data analysis working group*, UQAM and Université de Sherbrooke, online, 2021 – 2023.

Talks given:

- Persistence modules as sheaves, May 2022
- Topological data analysis to vectorize fMRI and hyperspectral scans, March 2022
- 2-parameter persistent homology, January 2022

Organizer **Member of the organizing committee**, *Colloque panquébécois de l'Institut des sciences mathématiques*, Montreal, May 2024.

**Member of the organizing committee**, *UQAM Graduate Students in Mathematics Seminar*, Montreal, 2019 – 2021.

Attendee **New structures in low-dimensional topology**, *Rényi Institute, Erdős Center*, Budapest, July 2024.

**Low Dimensional Topology Summer School**, *Institut Fourier, Université Grenoble Alpes*, Grenoble, June 2024.

**Applications of Representation Theory in Topological Data Analysis & Geometric Invariant Theory**, *UQAM*, Montréal, June 2024.

**Cornell Topology Festival**, *Cornell University*, Ithaca, May 2024.

**2024 Geometry and Topology Workshop**, *UCLA*, Los Angeles, January 2024.

**Gauge Theory and Topology: in Celebration of Peter Kronheimer's 60th Birthday**, *Oxford University*, Oxford, July 2023.

**Groups Around 3-Manifolds**, *Centre de recherches mathématiques*, Montreal, June 2023.

**Summer school and fibering spaces and their connections**, *Université de Sherbrooke*, Sherbrooke, June 2023.

**Workshop on Interactions of 3- & 4-dimensional Topology**, *Northeast University, Tsinghua University and Beijing University*, online, March 2023.

**Winter school in singularities and low-dimensional topology**, *Rényi Institute, Erdős Center*, Budapest, January 2023.

**2nd Canadian Geometry-Topology Seminar**, *UQAM*, Montreal, November 2022.

**Frontiers in Geometry and Topology Summer School**, *International Center for Theoretical Physics*, online, August 2022.

**Summer school on Alexander polynomials Knots and complex curves**, *Université de Nantes*, Nantes, May 2022.

**Braids in Low-Dimensional Topology**, *The Institute for Computational and Experimental Research in Mathematics*, Providence, April 2022.

**Tech Topology Conference**, *Georgia Institute of Technology*, online, December 2021.

## Honors and awards

- 2025 – 2027 **Postdoctoral Fellowship**, *Natural Sciences and Engineering Research Council of Canada (NSERC)*, 140000\$.
- 2025 **Award for Excellence - Best student research**, *Faculty of science, UQAM*, 1000\$.
- 2025 **Scholarship for Outstanding PhD Candidates**, *Institut des sciences mathématiques (ISM)*, 7500\$.
- 2024 **ISM Graduate Scholarship**, *ISM*, 5000\$.
- 2021 – 2024 **Doctoral Research Scholarship**, *Fonds de recherche du Québec – Nature et technologies (FRQNT)*, 84000\$.
- 2020 – 2021 **Master's Research Scholarship**, *FRQNT*, 17500\$.
- 2019 – 2020 **Canada Graduate Scholarships – Master's Program**, *NSERC*, 17500\$.
- 2018 and 2019 **Undergraduate Student Research Award**, *NSERC*, 5625\$ and 6200\$.

## Social engagement

- 2020 – current **Student council member**, *Graduate Mathematics program committee*, UQAM, Montreal.
  - Defining and aligning curriculum structure of graduate programs in mathematics and their objectives, in collaboration with council faculty members and the administration.

- April 2022 **Invited speaker**, MAT6221 *History of mathematics*, UQAM, Montreal.
- and 2023
- Talk titled *Women mathematicians in geometry and topology*, highlighting the achievements of three female mathematicians of the 20th century.
  - Conference given as part of a course in the bachelor in mathematics education and the bachelor in mathematics programs.
- 2020 **Organizing committee and editing-revision**, *Project Femmes en maths*, online.
- Project to promote the contributions of women in mathematics
  - Maintenance of the website (<https://femmesenmaths.org/>), writing and editing-revision of publications, funding applications
- April 2019 **Invited panel member**, *Math Day for CEGEP Girls*, Montreal.

## Teaching experience

- 2017 – 2023 **Lecturer and preceptor**, *School of Optometry – UdeM*, Montreal.
- OPM4801 Specialized clinical internship - Community clinic (2021 – 2023)
  - SCV2152 Vision sciences: Ocular dioptrics (fall 2020)
  - OPM4701, OPM37011 Primary care clinical internship (2017 – 2021)
  - OPM6052 Advanced clinical optometry (summer 2018)
- 2020 – 2021 **Teaching assistant**, *Département de mathématiques – UQAM*, Montreal.
- MAT2150 Analysis II (fall 2021)
  - MAT2250 Group theory (fall 2020, fall 2021)
  - MAT2400 Geometry (fall 2020)
  - MAT0339 General mathematics (summer 2020)
  - MAT0344 Integral calculus (winter 2020)

## Professional experience

- 2021 – 2024 **Consultant, Data Analytics and Optometry**, *Optina Diagnostics*, Montreal.
- Analysis of clinical data acquired with Optina Diagnostics' ocular imaging technology, aimed at developing machine learning models to aid in the diagnosis of various systemic diseases
  - Designing research protocols and clinical documentation
  - Presenting results to collaborators and investors
  - Training staff at affiliated research sites
- 2017 – 2020 **Research Associate**, *Research Institute - McGill University Health Centre (RI-MUHC)*, Montreal.
- Oculovisual evaluation, diagnostic monitoring and therapy of patients in Phase II and III clinical studies
  - Development of logistical processes for implementing research protocols, in collaboration with other professionals in the hospital setting
- 2010 – 2025 **Optometrist**, *member of the Ordre des optométristes du Québec*, no. 321032.

## Languages

French  
English