

# Patricia Sorya

sorya.patricia@courrier.uqam.ca

## 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)
- In preparation **Sorya, Patricia**. *Computing the Knot Floer complex of low thickness knots*.
- Sorya, Patricia** and Wakelin, Laura. *Finding characterising slopes for all knots*.

## Talks and conferences

- Invited speaker **Bounding non-characterizing non-integral Dehn surgeries**, *Topology seminar*, Princeton University, Princeton, December 2024 (upcoming).

**Bounding non-characterizing non-integral Dehn surgeries**, *Topology seminar*, University of Texas, Austin, October 2024 (upcoming).

**Bounding non-characterizing non-integral Dehn surgeries**, *The Boston College Geometry, Topology and Dynamics seminar*, Boston College, September 2024 (upcoming).

**Non-integral Dehn surgeries characterize composite knots**, *Topology seminar*, Dartmouth College, September 2024 (upcoming).

**Non-integral Dehn surgeries characterize composite knots**, *Topology seminar*, Max Planck Institute for Mathematics, Bonn, July 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 2024.

**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:

- Explicit characterising slopes for all knots!, août 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 Laudenbach 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:

- 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 **Scholarship for Outstanding PhD Candidates**, *Institut des sciences mathématiques (ISM)*, 7500\$.
- 2024 **ISM Graduate Scholarship**, *ISM*, 29000\$.
- 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**, *Natural Sciences and Engineering Research Council of Canada (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.
  - Define and align curriculum structure of graduate programs in mathematics and their objectives, in collaboration with council faculty members and the administration.
- April 2022 and 2023 **Invited speaker**, *MAT6221 History of mathematics*, UQAM, Montreal.
  - 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.

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## 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 General clinic (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)

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## 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 – current **Optometrist**, *member of the Ordre des optométristes du Québec*, no. 321032.

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## Languages

French  
English