Patricia Sorya

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Academic experience

2025 – 2028 (upcoming) **Postdoctoral researcher**, *Natural Sciences and Engineering Research Council of Canada (NSERC) fellowship – University of Ottawa and Boston College*, Ottawa and Boston.

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.)

Sorya, Patricia. *Computing the Knot Floer complex of knots of thickness one*. arXiv:2505.13610 (2025) (submitted to Exp. Math.)

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 ≤ 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^e 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 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:

- 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 comittee, *Colloque panquébécois de l'Institut des sciences mathématiques*, Montreal, May 2024.

Member of the organizing comittee, *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 fibring 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 **Carl Herz Prize**, *Institut des sciences mathématiques (ISM)*, 5000$.

2025 – 2027 **Postdoctoral Fellowship**, *Natural Sciences and Engineering Research Council of Canada (NSERC)*, 140000$.

2025 **Award for Excellence - Best student research**, *Faculty of sciences, UQAM*, 1000$.

2025 **Scholarship for Outstanding PhD Candidates**, *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 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.

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