

Patricia Sorya

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Academic experience

- 2025 – 2027 **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**, *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 and Wakelin, Laura. *Effective bounds on characterising slopes for all knots*. . Trans. Amer. Math. Soc. (to appear) arXiv:2410.24209

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

Talks and conferences

- Invited speaker **On the number of shared Dehn surgeries between two knots**, *Geometry and Topology seminar*, University of Ottawa, Ottawa, November 2025.
- 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.
- Complexe de Floer de noeuds d'épaisseur 1**, *Colloque panquébécois de l'Institut des sciences mathématiques*, Montreal, June 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 , <i>Low dimensional topology working group of the CIRGET</i> , Montreal, 2019 – 2025. Talks given: <ul style="list-style-type: none">○ 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, co-founder and organizer (rotating) , <i>CIRGET Topology students reading group</i> , Montreal, 2021 – 2025. Talks given: <ul style="list-style-type: none">○ 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 , <i>Topological data analysis working group</i> , UQAM and Université de Sherbrooke, online, 2021 – 2023. Talks given: <ul style="list-style-type: none">○ 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 , <i>Colloque panquébécois de l'Institut des sciences mathématiques</i> , Montreal, May 2024. Member of the organizing committee , <i>UQAM Graduate Students in Mathematics Seminar</i> , Montreal, 2019 – 2021.
Attendee	New structures in low-dimensional topology , <i>Rényi Institute, Erdős Center</i> , Budapest, July 2024. Low Dimensional Topology Summer School , <i>Institut Fourier, Université Grenoble Alpes</i> , Grenoble, June 2024. Applications of Representation Theory in Topological Data Analysis & Geometric Invariant Theory , <i>UQAM</i> , Montréal, June 2024. Cornell Topology Festival , <i>Cornell University</i> , Ithaca, May 2024. 2024 Geometry and Topology Workshop , <i>UCLA</i> , 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 – 2027 **Postdoctoral Fellowship,** Natural Sciences and Engineering Research Council of Canada (NSERC), 140000\$.
- 2025 **Carl Herz Prize,** Institut des sciences mathématiques (ISM), 5000\$.
- 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 **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