



Lida Kanari

- Group website
- Oxford, UK
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About me

I am an applied mathematician developing mathematical and computational frameworks for understanding biological structure across scales. I lead the NeuroTopology Group at Oxford, combining algebraic topology, stochastic and generative modelling, and data-centric methods to understand how cellular structure gives rise to tissue and network organisation.

Interests

- > Applied Mathematics
- > Topological Data Analysis
- > Computational Topology
- > Stochastic Processes
- > Machine Learning
- > Computational Neuroscience

Programming

Python, C++, Fortran

Languages

Greek, English, French

Teaching areas

- > Machine Learning
- > Algebraic Topology
- > Analysis
- > Computational Neuroscience
- > Computational Topology

Academic appointments

2025–now	Research Fellow & Lecturer <i>Founder & Group Leader, NeuroTopology</i>	University of Oxford, UK
2022–2025	Group Leader & Lecturer <i>Neuromathematics Group</i>	EPFL, Lausanne
2019–2022	Group Leader <i>Neuromathematics Group</i>	EPFL, Lausanne
2018–2019	Postdoctoral Researcher <i>Computational neuroscience and neuronal morphologies</i>	EPFL, Lausanne
2011–2012	Research Assistant <i>Biomechanics Laboratory</i>	NTUA, Greece
2009–2010	Summer Research Internship <i>Particle detection analysis</i>	CERN, Geneva

Education

2012–2018	PhD Computational Neuroscience <i>Neuronal morphologies: the shapes of thoughts</i>	EPFL, Lausanne
2011–2012	MSc Computational Mechanics <i>Fluid Mechanics and Biomechanics</i>	NTUA, Greece
2006–2011	MSc Applied Mathematics & Physics <i>Theoretical and Particle Physics</i>	NTUA, Greece

Research funding

2025–now	UKRI–MRC Career Development Award <i>Algebraic topology bridging the gap between single neurons and networks</i>	PI, £1.4M
2024	Catalyseur–Fondation Courtois <i>coCP with Eilif Muller</i>	\$100K
2024	SAGES <i>coPI with Barbara Giunti</i>	\$14K
2022	EPFL Workshop Grant <i>Organizer, Mouse Neuronal Morphologies in Health and Disease</i>	CHF 30K

Awards & distinctions

2018, 2017	OCNS	Travel & Poster Award
2011–2012	Limmat Stiftung Scholarship M.Sc. Computational Mechanics	Highest GPA
2011–2012	State Foundation of Fellowships, Greece M.Sc. Computational Mechanics	State Fellowship
2006–2011	State Foundation of Fellowships, Greece M.Sc. Applied Mathematics & Physics	Highest GPA
2009–2010	International Mathematical Competitions	Competition Awards

Intellectual property

2019	Synthesis of branching morphologies	Patent application 20190100470 L. Kanari, K. Hess Bellwald, H. Markram
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Academic Service

2026	Associate Editor in <i>Brain Informatics</i>	Springer Nature
2026	Fellow of the <i>Young Academy of Europe</i>	YAE
2026	Member of <i>ENCODE</i>	AI for Science
2023	Member of <i>WinCompTop</i>	Women in Computational Topology

Teaching & course development

2025–now	Machine Learning <i>Course designer & lecturer</i>	University of Oxford
2022–2023	Mathematical Methods for Neuroscience <i>Course designer & lecturer</i>	EPFL
2015–2022	Simulation Neuroscience <i>Teaching contribution</i>	edX MOOC
2016–2017	Symmetry and Conservation in the Cell <i>Teaching contribution</i>	EPFL
2012–2014	Analysis II, Advanced Analysis II & Numerical Analysis <i>Undergraduate mathematics teaching</i>	EPFL

Examining & assessment

2012–2025	Undergraduate examination marking <i>Analysis, Advanced Analysis, Computational & Simulation Neuroscience</i>	EPFL
2026	Undergraduate examination marking <i>PDEs & Fourier Series</i>	University of Oxford
2025–2026	Doctoral Confirmation viva examiner Ph.D. examination	University of Oxford
2026	Master's thesis viva examiner Graduate examination	University of Oxford

Graduate supervision & research mentoring

2026–now	Doctoral supervision Two incoming doctoral researchers, NeuroTopology	University of Oxford
2018–2022	Doctoral co-supervision Adelie Garin, with Kathryn Hess	EPFL
2014–2025	Master's & research supervision 7 Master's theses, 7 Master's research projects, 3 research internships	EPFL
2019–2025	Postdoctoral & research staff mentoring 5 Postdoctoral researchers, 4 software engineers and specialist scientific staff	EPFL
2019–now	Career mentoring Informal PhD mentoring and doctoral career support	EPFL / Oxford

Academic leadership & administration

2025–now	Research programme leadership <i>£1.4M UKRI–MRC programme; group development and resource management</i>	University of Oxford
2019–2025	Research group leadership <i>Team of ~8; research resources of ~CHF 500–800K/year</i>	EPFL
2019–now	Recruitment & selection <i>Hiring panels; researcher and student selection; staff onboarding</i>	EPFL / University of Oxford
2019–2025	Institutional representation <i>Research-group representation in institutional meetings</i>	Blue Brain Project / Open Brain Institute

Community service

Outreach	Neuron Classification, From neurons to Networks, Building neurons, and others
Inclusion	Girls in STEM; school engagement; Women In Computational Topology
Organizer	HBP workshops; International morphology workshop; Open Brain Institute workshops; CNS & SfN workshops
Peer reviews	Nature, Nature Neuroscience, Nature Communications, La Mathematica, Nature Biotechnology, PLOS Computational Biology, and others

Selected Publications

2026	Spatial continuity of neurons explains non-random network architecture. Reimann M.W., Egas Santander D., Kanari L. and Barros-Zulaica N.	<i>iScience</i>
2025	Of mice and men: Dendritic architecture differentiates human from mouse neuronal networks. Kanari L., Shi Y., Arnaudon A. et al.	<i>iScience</i>
2022	Computational synthesis of cortical dendritic morphologies. Kanari L., Dictus H., Chalimourda A. et al.	<i>Cell Reports</i>
2020	From trees to barcodes and back again: theoretical and statistical perspectives. Kanari L., Garin A. and Hess K.	<i>Algorithms</i>
2018	A Topological Representation of Branching Neuronal Morphologies. Kanari L., Dłotko P., Scolamiero M. et al.	<i>Neuroinformatics</i>

Additional Publications

- 2026 Deep learning for classifying neuronal morphologies: combining topological data analysis and graph neural networks. Kanari L., Schmidt S., Casalegno F. et al.
Scientific Reports (in press)
- 2026 Decomposing the Persistent Homology Transform of Star-Shaped Objects. Arya S., Giunti B., Hickok A., Kanari L., McGuire S. and Turner K.
Research in Computational Topology 3 (in press)
- 2026 Temporal Topology Provides an Interpretable Framework for Neuronal Morphogenesis. Rigaux K., Ferreira Castro A. and Kanari L.
Neuroinformatics
- 2026 A multimodal spatial atlas of transcriptomic, morphological, and electrophysiological cell type densities in the mouse brain. Veraszto C., Roussel Y., Kanari L. et al.
PLOS Computational Biology
- 2026 Modeling and Simulation of Neocortical Micro- and Mesocircuitry. Part I: Anatomy. Reimann M.W., Bolaños-Puchet S., Courcol J.-D. et al.
eLife
- 2025 Generating brain-wide connectome using synthetic axonal morphologies. Petkantchin R., Berchet A., Peng H., Markram H. and Kanari L.
Nature Communications
- 2025 Breakdown and repair of metabolism in the aging brain. Shichkova P., Coggan J.S., Kanari L. et al.
Frontiers in Science
- 2025 Computational Generation of Long-range Axonal Morphologies. Berchet A., Petkantchin R., Markram H. and Kanari L.
Neuroinformatics
- 2024 Community-based reconstruction and simulation of a full-scale model of the rat hippocampus CA1 region. Romani A., Antonietti A., Bella D. et al.
PLOS Biology
- 2024 BlueCelluLab: Biologically Detailed Neural Network Experimentation API. Tuncel A., Van Geit W., Gevaert M. et al.
Journal of Open Source Software
- 2024 From Trees to Barcodes and Back Again II: Combinatorial and Probabilistic Aspects of a Topological Inverse Problem. Curry J., DeSha J., Garin A. et al.
Computational Geometry
- 2023 Controlling morpho-electrophysiological variability of neurons with detailed biophysical models. Arnaudon A., Reva M., Zbili M. et al.
iScience
- 2023 Strong and reliable synaptic communication between pyramidal neurons in adult human cerebral cortex. Hunt S., Leibner Y., Mertens E.J. et al.
Cerebral Cortex
- 2022 A tool for mapping microglial morphology, morphOMICS, reveals brain-region and sex-dependent phenotypes. Colombo G., Cubero R.J.A., Kanari L. et al.
Nature Neuroscience
- 2021 Digital Reconstruction of the Neuro-Glia-Vascular Architecture. Zisis E., Keller D., Kanari L. et al.
Cerebral Cortex
- 2019 Objective Morphological Classification of Neocortical Pyramidal Cells. Kanari L., Ramaswamy S., Shi Y. et al.
Cerebral Cortex
- 2017 Comprehensive Morpho-Electrotonic Analysis Shows 2 Distinct Classes of L2 and L3 Pyramidal Neurons in Human Temporal Cortex. Deitcher Y., Eyal G., Kanari L. et al.
Cerebral Cortex
- 2016 Framework for efficient synthesis of spatially embedded morphologies. Vanherpe L., Kanari L. et al.
Physical Review E
- 2016 In situ synthesis and simulation of polydisperse amphiphilic membranes. Vanherpe L., Kanari L. et al.
IJAESAM
- 2015 Reconstruction and Simulation of Neocortical Microcircuitry. Markram H., Muller E., Ramaswamy S. et al.
Cell
- 2015 The neocortical microcircuit collaboration portal: a resource for rat somatosensory cortex. Ramaswamy S., Courcol J.-D., Abdellah M. et al.
Frontiers in Neural Circuits

Preprints

- 2026 Contextual Cellular Growth (ConCeG) of neural cells for realistic grey matter tissue generation for diffusion MRI simulations. Aird-Rossiter C., Şimşek K., Jallais M., Jones D.K., Kanari L. and Palombo M. *arXiv, under review*
- 2026 Self-organized tiling generates tissue-scale hyperuniformity during development. Siegert S., Kanari L. and Can Uçar M. *bioRxiv, under review*
- 2026 Chromatic topological mapping reveals organelle-specific spatial organization within microglia. Agerberg J., Kanari L., Maes M.E., Chachólski W., Siegert S. and Scolamiero M. *bioRxiv, under review*
- 2026 Uncovering the Basis of Human Connectome Complexity: The Role of Neuronal Morphology. Barros-Zulaica N., Egas Santander D., Kanari L. et al. *bioRxiv, under review*
- 2026 A detailed model for understanding the human neocortex. Barros-Zulaica N., Kanari L. et al. *bioRxiv, to be submitted*

Selected Invited Talks & Conferences

2026	Erlangen TDA Seminar, September <i>From Neurons to Networks: Understanding the Brain through Algebraic Topology</i>	Oxford, UK
2026	CNS: The 4D Connectome <i>From neurons to networks: Exploring the brain through algebraic topology</i>	Oxford, UK
2025	Erlangen TDA Seminar, October <i>From Neurons to Networks: Understanding the Brain through Algebraic Topology</i>	London, UK
2025	Queen Mary, University of London <i>From neurons to complex human networks using algebraic topology</i>	London, UK
2025	CNS Tutorial <i>Open Brain Institute: From single neurons to complex networks</i>	Florence, Italy
2025	BrainNet: <i>From single neurons to complex networks through TDA</i>	Stockholm, Sweden
2024	<i>From single neurons to complex human networks using algebraic topology</i>	Oxford, UK
2024	EPFL Applied Machine Learning Days <i>From single neurons to complex human networks</i>	Lausanne, Switzerland
2023	ICERM: Topology and Geometry in Neuroscience <i>From single neurons to complex networks using algebraic topology</i> ; invited by Carina Curto	Providence, US
2023	Microstructure by the Lake <i>From single neurons to complex networks using algebraic topology</i> ; invited by Erick J. Canales-Rodriguez	Lausanne, Switzerland
2023	Form and Function of Complex Systems <i>From single neurons to complex networks using algebraic topology</i> ; invited by Gabriele Manoli	Lausanne, Switzerland
2023	Women in Computational Topology <i>Persistence Homology Transform</i>	Lausanne, Switzerland
2022	VU Amsterdam Math Neuro Workshop <i>Algebraic topology insights on mouse and human neuronal morphologies</i> ; invited by Daniele Avitabile	Amsterdam, Netherlands
2022	BICCN Morphology Working Group <i>Computational synthesis of cortical dendritic morphologies</i> ; invited by Giorgio Ascoli	Online
2021	MSRI Hot Topics: Topological Insights in Neuroscience <i>Topological insights on neuronal morphologies</i>	Online
2020	NeurIPS: TDA and Beyond <i>Topological insights on neuronal morphologies</i>	Online
2020	COSYNE: Neural networks that are neuronal networks: Considerations of neuron morphology in circuit computations <i>Topological synthesis</i>	Denver, US
2019	CNS <i>Topological synthesis</i> ; invited by Hermann Cuntz	Seattle, US
2017	Edmond and Lily Safra Center for Brain Sciences Retreat <i>Topological representation of neuronal morphologies</i> ; invited by Idan Segev	Ein Gedi, Israel
2017	Applied Algebraic Topology <i>Topological representation of neuronal morphologies</i> ; invited by Kathryn Hess	Sapporo, Japan
2016	BigNeuron Hackathon <i>Analysis, validation and synthesis of neuronal morphologies</i> ; invited by Hanchuan Peng	London, UK
2016	Applications and Statistics of Multidimensional Persistence <i>Topological representation of branching neuronal morphologies</i> ; invited by Martina Scolamiero	Lausanne, Switzerland