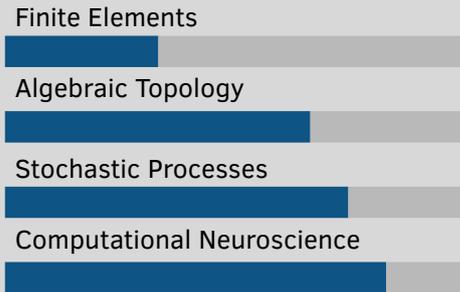# Lida Kanari

- 17 October 1988
- From Athens, Greece
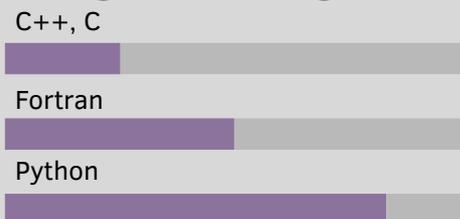- Lives in Lausanne, Switzerland
- lida.kanari@gmail.com

About me

I am a trained mathematician and physicist that found myself in the world of neuroscience, during my PhD. Incorporating mathematical ideas in the neuroscience field, gave rise to novel theories for the description and computational generation of neuronal trees. My interests include mathematical modeling of randomness and structure in cerebral and vascular systems. Apart from science, I'm interested in theater, music, movies, photography and books. When I get the opportunity, I enjoy hiking, biking and kayaking.

Skills

Finite Elements

Algebraic Topology

Stochastic Processes

Computational Neuroscience

Programming

C++, C

Fortran

Python

Languages

Greek, English, French

Professional experience

2025–	Research Fellow & Lecturer *NeuroTopology*	University of Oxford, UK
2022-2025	Group Leader & Lecturer *Neuromathematics*	EPFL, Lausanne
2019–2022	Group Leader *Neuromathematics*	EPFL, Lausanne
2018–2019	Post-Doc Computational Neuroscience *Neuronal morphologies*	EPFL, Lausanne
2011–2012	Research assistant Biomechanics lab	NTUA, Greece
2009–2010	Summer School Internship Analysis of particle detection	CERN, Geneva

Education

2012–2018	Ph.D. Computational Neuroscience *Neuronal morphologies: the shapes of thoughts.*	EPFL, Lausanne
2011–2012	M.Sc. Computational Mechanics Majoring in Fluid mechanics and Biomechanics	NTUA, Greece
2006–2011	M.Sc. Applied Mathematics and Physics Majoring in Theoretical and Particle Physics	NTUA, Greece

Awards

2018, 2017	Organization for Computational Neuroscience (CNS) Travel award, Best poster award
2011-2012	Limmat Stiftung Scholarship. Highest GPA in MsC, Computational Mechanics
	State Foundation of Fellowships, Greece. State Fellowship for MsC, Computational Mechanics
2006-2011	State Foundation of Fellowships, Greece. Highest GPA in MsC, Applied Mathematics and Physics
2009-2010	16th International Mathematical Competition, Budapest. Honorable Mention
2003-2005	Hellenic Mathematical Society. Distinctions & Awards in national competitions

Funding

2024	Algebraic topology bridging the gap between single neurons and networks Career Development Grant	UKRI - MRC $1.4M\pounds$
2024	Role of top-down contextual representations and inhibitory sub-populations in neocortical mismatch reponses coCP with Eilif Muller, Catalyseur-Fondation Courtois	$100K\$$
2023	S^1-persistence modules and Persistent Homology Transform coPI with Kate Turner and Barbara Giunti SAGES	$14K\$$
2023	ICERM: Mathematical Challenges Travel grant	$3K\$$
2022	Mouse Neuronal Morphologies in Health and Disease: Reconstruction, Analysis and Modellingp Workshop organization grant	$30KCHF$

Patents

Title : Synthesis of branching morphologies
Application No : 20190100470
Inventors : Lida Kanari, Kathryn Hess Bellwald, Henry Markram

Teaching

2025–	Machine Learning by Dr. L. Kanari	University of Oxford, Oxford
2022–2023	Mathematical Methods for Neuroscience by Dr. L. Kanari	EPFL, Lausanne
2015–2022	Simulation Neuroscience by Prof. H. Markram, Prof. I. Segev	MOOC in EdX, online
2016–2017	Symmetry and Conservation in the Cell by Dr. J. Shillcock	EPFL, Lausanne
2013–2014	Analysis II & Numerical Analysis by Prof. F. Margot by Prof. S. Deparis	EPFL, Lausanne
2012–2013	Analysis II & Advanced Analysis II by Prof. R. Hans-jörg	EPFL, Lausanne

Project supervision and mentoring

2023-2025	Darshan Mandge, Anil Tuncel, Ilkan Kilic, Aurelien Jaquier Project: *Modeling of dendritic electrophysiology*	Software engineers, EPFL
2020-2025	Adrien Berchet, Remy Petkantchin Project: *Axon synthesis*	Postdoctoral researchers, EPFL
2019-2025	Ying Shi Project: *Neuronal reconstructions*	Reconstruction specialist, EPFL
2019-2025	Alexis Arnaudon Project: *Morpho-electrical properties of neurons*	Postdoctoral researcher, EPFL
2019-2022	Stanislav Schmidt Project: *Machine learning of neuronal morphologies*	Software engineer, EPFL
2020	Valerii Souchoroukov Project: *Axon synthesis*	Postdoctoral researcher, EPFL

Student supervision

2018-2025	Alexia Stéphanie Liviana Paratte, Romane Cornali, Thomas Negrello Alain Walter, Jelena Banjac, Marc Fersztand, Abel Adary, Sébastien Morand Master thesis, EPFL
2020-2025	Jan Zgraggen, Mariia Vidmuk, Ananda Sophie Wolz, Christina Kapatsori, Killian Rigaux, Camille Frayssinhes, Dmitriev Daniil Master project, EPFL
2014-2024	Zhixin Wang, Jeanne Sentenac, Rebecca Elyanow Internship, EPFL

Selected Outreach

2023	`https://actu.epfl.ch/news/decoding-neuronal-variability-bridging-shape-and-b/`

2022	`https://actu.epfl.ch/news/blue-brain-builds-neurons-with-mathematics/`
	`https://actu.epfl.ch/news/pioneering-algebraic-topology-in-the-blue-brain-pr/`
	`https://bbp.epfl.ch/therealneuronchallenge/about.html`

2019	`https://actu.epfl.ch/news/blue-brain-solves-a-century-old-neuroscience-probl/`

Reviewer

Nature, Nature Neurosc, Nature Comms, Nature Biotech, Plos Comp Bio, Cosyne
Journal of mathematical biology, IEEE transactions on neural systems and rehabilitation engineering

Publications

2025*   Of mice and men: Dendritic architecture differentiates human from mouse neuronal networks. Kanari L. et al.   *iScience*

2025   Breakdown and repair of metabolism in the aging brain. Shichkova, P., Coggan, J.S., Kanari, L. et al.   *Front Sci*

2025*   Generating brain-wide connectome using synthetic axonal morphologies. Petkantchin R., Berchet A., Peng H., Markram H., and Kanari L.   *Nat Commun*

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 Region CA1 of Rat Hippocampus. Romani, A. et al.   *Plos Biology*

2024   BlueCelluLab: Biologically Detailed Neural Network Experimentation. Tuncel A. et al.   *JOSS*

2024   Modeling and Simulation of Neocortical Micro- and Mesocircuitry. Part I: Anatomy. Reimann M. et al.   *elife*

2023   Controlling morpho-electrophysiological variability of neurons with detailed biophysical models. Arnaudon A. et al.   *iScience*

2023   From Trees to Barcodes and Back Again II: Combinatorial and Probabilistic Aspects of a Topological Inverse Problem. Curry, J. at el.   *Computational Geometry.*

2023   Strong and reliable synaptic communication between pyramidal neurons in adult human cerebral cortex. Hunt, S. et al.   *Cerebral cortex*

2022*   Computational synthesis of cortical dendritic morphologies. Kanari L. et al.   *Cell Reports*

2022*   A tool for mapping microglial morphology, morphOMICs, reveals brain-region and sex-dependent phenotypes. Colombo G. et al.   *Nat Neurosc*

2021   Digital Reconstruction of the Neuro-Glia-Vascular Architecture. Zisis E. et al.   *Cerebral Cortex*

2020*   From trees to barcodes and back again: theoretical and statistical perspectives. Kanari L., Garin A., and Hess K.   *Algorithms*

2019   Objective Morphological Classification of Neocortical Pyramidal Cells. Kanari L. et al.   *Cerebral Cortex*

2018*   A Topological Representation of Branching Neuronal Morphologies. Kanari L. et al. *Neuroinformatics*

2017   Comprehensive Morpho-Electrotonic Analysis Shows 2 Distinct Classes of L2 and L3 Pyramidal Neurons in Human Temporal Cortex. Deitcher Y. et al.   *Cerebral Cortex*

2016   Framework for efficient synthesis of spatially embedded morphologies. Vanherpe L., Kanari L. et al.   *Phys. Rev. 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. et al.   *Cell*

2015   The neocortical microcircuit collaboration portal: a resource for rat somatosensory cortex. Ramaswamy S. et al.   *Front. Neural Circuits*

Preprints

2025	Quantifying neuronal differentiation using temporal topological persistence. Rigaux K., Castro A.F. and Kanari L. *bioarxiv*
2025	Neuron morphological physicality and variability define the non-random structure of connectivity. Reimann M.W., Egas-Santander D., Lida Kanari L. and Barros-Zulaica N. *bioarxiv*
2024	A quantitative spatial atlas of transcriptomic, morphological, and electrophysiological cell type densities in the mouse brain. Verasztó C., Roussel Y., Kanari L., Markram H. and Keller D. *bioarxiv*
2024	Deep learning for classifying neuronal morphologies: combining topological data analysis and graph neural networks. Kanari L. et al. *bioarxiv*
2024	Decomposing the Persistent Homology Transform of Star-Shaped Objects. Arya S., Giunti B., Hickok A., Kanari L., McGuire S. and Turner K. *arxiv*

Invited speaker - Selected Conferences

2025 CNS   Tutorial *Open Brain Institute: From single neurons to complex networks*   Florence, Italy

2025 BrainNet *From single neurons to complex networks using algebraic topology*   Stockholm, Sweden

2024 Oxford   *From single neurons to complex human networks using algebraic topology*   Oxford, UK

2024 EPFL   Applied Machine Learning Days *From single neurons to complex human networks*   Lausanne, Switzerland

2023 ICERM   Topology and Geometry in Neuroscience *From single neurons to complex networks using algebraic topology* invited by Carina Curto   Providence, US

2023   Microstructure by the Lake *From single neurons to complex networks using algebraic topology* invited by Erick J Canales-Rodriguez   Lausanne, Switzerland

2023   Form and Function of Complex Systems *From single neurons to complex networks using algebraic topology* invited by Gabriele Manoli   Lausanne, Switzerland

2023 WCT   Women in Computational Topology *Persistence Homology Transform*   Lausanne, Switzerland

2022   VU Amsterdam Math Neuro workshop *Algebraic topology insights on mouse and human neuronal morphologies* invited by Daniele Avitabile   VU, Amsterdam

2022 BICCN   Morphology Working Group *Computational synthesis of cortical dendritic morphologies* invited by Giorgio Ascoli   Online

2021 MSRI   Hot Topics: Topological Insights in Neuroscience *Topological insights on neuronal morphologies*   Online

2020 NeurIPS Topological Data Analysis and Beyond *Topological insights on neuronal morphologies*   Online

2020 Cosyne   Neural networks that are neuronal networks: Considerations of neuron morphology in circuit computations *Topological synthesis*   Denver, US

2019 CNS   CNS *Topological synthesis* invited by Hermann Cuntz   Seattle, US

2017 ELSC   Edmond and Lily Safra Center for Brain Sciences retreat *Topological representation of neuronal morphologies.* invited by Idan Segev   Ein Gedi, Israel

2017 AAT   Applied Algebraic Topology *Topological representation of neuronal morphologies.* invited by Kathryn Hess   Sapporo, Jappan

2016 BNH   BigNeuron Hackathon *Analysis, validation and synthesis of neuronal morphologies.* invited by Hanchuan Peng   London, UK

2016 ASMP   Applications and Statistics of Multidimensional Persistence *Topological representation of branching neuronal morphologies.* invited by Scolamiero Martina   Lausanne, Switzerland

2015 BIH   International Conference on Brain Informatics and Health *Automated reconstruction, analysis, classification and synthesis of neuronal morphologies.* invited by Hanchuan Peng   London, UK

2015 BNH   BigNeuron Hackathon *Automatic analysis of neuronal morphologies.* invited by Hanchuan Peng   Cambridge, UK