

Alice Patania, PhD

Assistant Research Scientist
Indiana University Network Science Institute (IUNI)

E-mail: alice.patania@gmail.com
Website: <https://alpatania.github.io>

Alice Patania
1001 E SR 45/46 Bypass
Bloomington (IN), 47408
USA

Publications

In Peer-Reviewed Journals

- "Topological Analysis of Differential Effects of Ketamine and Propofol Anesthesia on Brain Dynamics" - TF. Varley, O. Sporns, **A. Patania**. *Royal Society Open Science* 8 (6), 201971
- "A framework for studying choices in networks" - F. Feinberg, M. Braun, N. Fefferman, J. Helveston, B. Hemenway Falk, D. Lerramore, E. McDonnell, B. McShane, **A. Patania**, M. Small, E. Bruch. *Marketing Letters* (2020) 31(4):349-59
- "Networks beyond pairwise interactions: structure and dynamics" - F. Battiston, G. Cencetti, I. Iacopini, V. Latora, M. Lucas, **A. Patania**, J.-G. Young, G. Petri. *Physics Reports* (2020) 874 1-82.
- "Topological gene-expression networks recapitulate brain anatomy and function" - **A. Patania**, P. Selvaggi, M. Veronese, O. DiPasquale, P. Expert, G. Petri. *Network Neuroscience* (2019): 1-20¹
- "Navigating features: a topologically informed chart of electromyographic features space" - A. Phinyomark, R. N Khushaba, E. Ibáñez-Marcelo, **A. Patania**, E. Scheme, G. Petri. *Journal of The Royal Society Interface* 14.137 (2017) p.20170734
- "Construction of and efficient sampling from the simplicial configuration model" - J.-G. Young, G. Petri, F. Vaccarino, **A. Patania**. *Physical Review E* 96 (2017) p.032312 (arXiv:1705.10298) ²
- "The shape of collaboration" - **A. Patania**, G. Petri, F. Vaccarino. *EPJ Data Science* (2017) 6(1), p.18
- "Topological Analysis of Data" - **A. Patania**, F. Vaccarino, G. Petri. *EPJ Data Science* (2017) 6(1), p.7
- "P-persistent homology of finite topological spaces" - **A. Patania**, G. Petri, F. Vaccarino. *Rendiconti del Seminario Matematico, Università e Politecnico di Torino* 75:2 (2017), pp. 27-45. (arXiv:1502.04873)

Under Revision

- "Nerve Theorems for fixed points of neural networks" - F. Burtscher, C. Curto, S. Ebli, DE Santander, K. Morrison, **A. Patania**, N. Sanderson. *AWM/Springer volume entitled Research in Computational Topology 2*.
- "Generalized Penalty for Circular Coordinate Representation" - H. Luo, A. Patania, J. Kim, M. Vejdemo-Johansson. *Journal of Applied and Computational Topology*.
- "Characterization of genetic expression patterns in Mild Cognitive Impairment using a multiomics approach and neuroimaging endophenotypes" - A. Bharthur Sanjay, **A. Patania**, X. Yan, D. O. Svaldi, and L. Apostolova. *JAMA Neurology or Alzheimer's and Dementia*

Pre-print

- "Nerve Theorems for fixed points of neural networks" - F. Burtscher, C. Curto, S. Ebli, DE Santander, K. Morrison, **A. Patania**, N. Sanderson arXiv:2102.11437 (2021).

¹A python implementation is available at: https://github.com/alpatania/AHBA_microarray Mapper

²A C++ implementation is available at: <https://github.com/jg-you/scm>.

- "Generalized Penalty for Circular Coordinate Representation" - H. Luo, **A. Patania**, J. Kim, M. Vejdemo-Johansson. arXiv:2006.02554 (2020).
- "Topological Analysis of Differential Effects of Ketamine and Propofol Anesthesia on Brain Dynamics" - T. F. Varley, O. Sporns, **A. Patania**. bioRxiv (2020).
- "Complex Systems Techniques applied to Power Transmission Expansion Planning" - S. Lumbreras, M. Pereda, I. Bertazzi, **A. Patania**, J.-G. Young, D. Citron, M. Haraguchi - Proc. CSSS 2015 - (2015) Contribution in: "Part I: Generating Random Networks that are Consistent with Power Transmission".
- "Quantitative Semantic and Topological Analysis of UK House of Commons Debates" - S. Gurciullo, M. Smallegan, M. Pereda, F. Battiston, **A. Patania**, S. Poledna, D. Hedblom, B. T. Oztan, A. Herzog, P. John, S. Mikhaylov (2015) - arXiv:1510.03797 (2015)

Appointments held

Assistant Research Scientist
IUNI, Bloomington (IN)

July 2017 - present

Assistant Research Scientist at Indiana University Network Science Institute (IUNI) in Bloomington, IN.

PhD Student

Jan 2014 - May 2017

I.S.I. Foundation, Turin (IT)

Part of the "Mathematics and Foundation of Complex Systems" research group at ISI Foundation.

Junior Researcher

Jun 2013 - Dec 2013

I.S.I. Foundation, Turin (IT)

Part of the "Mathematics and Foundation of Complex Systems" research group at ISI Foundation. Tasks:

- Writing a working code that computes the tidy set of a simplicial complex;
- Working on the categorical foundations of persistent homology;
- Working on application of discrete exterior calculus to complex systems and network theory.

Visiting

- EPFL, Lausanne, Switzerland July 2018
- Politecnico di Torino, Torino, IT September 2017
- Centre for Neuroimaging Science, King's College London, UK, January 2017
- Dynamica Research Group, Université Laval, Québec City (QC), Canada, August 2016
- Prof. Seth Lloyd, M.I.T., Cambridge (MA), USA Nov-Dec 2015

Education

Politecnico di Torino & I.S.I. Foundation

Jan 2014 - May 2017

PhD in Applied Mathematics cum laude - thesis: *Simplicial Data Analysis*

University of Torino

Sep 2009 - Mar 2013

MSc in Mathematics - thesis: *Persistent Homology*

University of Torino

Sep 2006 - Mar 2010

BSc in Mathematics - thesis: *Counterexamples in general topology*

Conference Communications

Talks

"The simplicial configuration model: a sampling method"	
ICIAM 2019, Valencia, Spain	Jul 2019
"Application of topological data analysis to the detection of mild cognitive impairment"	
SIAM AG, Bern, Switzerland	Jul 2019
"Topological summaries for the analysis of neuroimaging datasets"	
Network Neuroscience, NetSci 2019, Burlington (VT), U.S.A.	Jun 2019
"Computational Tools for handling simplicial complexes in real datasets"	
Invited Talk , EPFL Lausanne, Switzerland	Jun 2018
"Topological gene expression networks capture spatial and gene-gene interactions"	
Politecnico di Torino, Seminari di Geometria, Turin, Italy	Sep 2017
"Topological gene expression networks capture spatial and gene-gene interactions"	
Network Neuroscience, NetSci 2017, Indianapolis (IN), U.S.A.	Sep 2017
"Topological gene expression networks for neuroimaging"	
Centre for Neuroimaging Science, King's College London, London, U.K.	Jan 2017
"Topological gene expression networks capture spatial and gene-gene interactions"	
Conference on Complex Systems, Amsterdam, Netherlands	Sep 2016
"Topological Data Analysis with applications to neuroscience"	
Theoretical Physics Seminar Series, Université Laval, Québec City, Canada	Aug 2016
"A hierarchical stochastic growth model for simplicial complexes"	
SINM Satellite Conference of NetSci - International Conference on Network Science, Seoul, South Korea	Jun 2016

Posters

"Construction and efficient sampling from the simplicial configuration model"	
Workshop on Topology and Neuroscience, EPFL Lausanne, Switzerland	Nov 2018
"Topology of Networks Time-delay Embeddings"	
NetSci - International Conference on Network Science, Zaragoza, Spain	Jun 2015
"Poset persistence as sublevel filtration of weighted objects"	
Workshop on Discrete, Computational and Algebraic Topology, University of Copenhagen, Denmark	Nov 2014
"One graph to rule them all"	
Workshop on Topology and Geometry of Networks and Discrete Metric Spaces, Institute for Mathematics and its Applications, Minneapolis (MN), U.S.A.	May 2014

Schools/Workshop

Applied Mathematical Modeling with Topological Techniques	Aug 2019
ICERM, Providence (RI), U.S.A.	
WinCompTop: Women in Computational Topology	Jul 2019
ANU, Melbourne, Australia	
11th Triennial Invitational Choice Symposium: Decision Processes in Networks	Jun 2019
Georgetown University, Maryland, U.S.A.	
2nd EATCS young researchers school	Jul 2015
Camerino, Italy	
SFI Complex Systems Summer School	Jun 2015
Santa Fe Institute, NM, USA	
Homology: Theoretical and Computational Aspects	Feb 2015
Genova, Italy	
ECCS Warm up School and Conference	Sep 2014
IMT Lucca, Italy	
ACAT Summer School on computational topology and topological data analysis	Jul 2013

Ljubljana, Slovenia

Funding and Awards

Principal Investigator

Jun 2021-Apr 2023

NIH Grant - R21 AG072101 - Integrative Predictive Modeling of Alzheimer's Disease

Scientific Collaborator

Aug 2018-Apr 2019

NIH Grant - R01 AG040770 - Imaging and genetic biomarkers for Alzheimer's disease with M.D. Liana G. Apostolova

PhD Fellowship, I.S.I. Foundation

Feb 2014-Jan 2017

Bridge Grant, Y.R.N.C.S.

2016

with Jean-Gabriel Young, Université Laval

Logo Design for Y.R.N.C.S.

2016

Academic Service

Software Development

MapperTools - <https://alpatania.github.io/MapperTools>

Python implementation of Mapper algorithm.

SASSAFRAS- <https://alpatania.github.io/sassafras>

Simple and automatic aggregator for Google Scholar.

Conferences

- Program Committee NetSciX 2019, Tokyo, Japan
- Program Committee IEEE ICMLA 2019 - Special Session on TDA in ML, Boca Raton (FL), U.S.A.
- Adjacent Activities Committee NetSci 2019 in Burlington (VT), 27-31 May 2019
- Co-chair of the Open Network Science Hackathon in Burlington (VT), 25-26 May 2019
- Organizer of the Warm-up Summer School for the Complex Systems Conferences 2018 in Thessaloniki (Greece)
- Organizer of the Warm-up Summer School for the Complex Systems Conferences 2017 in Cancún (Mexico)
- Program Committee CompleNet 2017, Dubrovnik, Croatia
- Volunteer, Applied Topology: Methods, Computation, and Science, Torino, Jul. 2016

Institutional Appointments

- Treasurer and Member of Advisory Board of the Young Researchers Network on Complex Systems, 2017-2019
- Member, Commissione Didattica Paritetica of the Department of Mathematics, Jun. 2009 - Jun. 2011
- Member, Commissione Didattica Paritetica of the Faculty of Mathematical, Physical, and Natural Sciences, Jun. 2009 - Jun. 2011

Professional Membership

- Member of Women in Computational Topology
- Member of Complex Systems Society
- Member of the Young Researchers Network on Complex Systems
- Member of the Network Science Society