Curriculum Vitæ

Ximena Fernández

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Current Position

- Research Officer at the College of Science of Swansea University, UK.
- Member of the Centre for Topological Data Analysis in UK.

Education

2020-2023	**Postdoc Fellowship**, College of Science, Swansea University. **Mentor**: Dr. Jeffrey Giansiracusa. *Area:* Topological Data Analysis.
2011-2017	**PhD in Mathematics**, Department of Mathematics, University of Buenos Aires. **Advisor**: Dr. Elías Gabriel Minian. *Area:* Algebraic, Combinatorial and Computational topology. *Title*: Combinatorial methods and algorithms in low dimensional topology and the Andrews-Curtis conjecture. *Dissertation Committee*: Graham Ellis. Prof. NUI, Irlanda. Gaston García. Adj. Prof. Adj. Universidad de La Plata and Adj. Resercher CONICET. Mariano Suarez Alvarez. Adj. Prof. DM UBA and Adj. Resercher CONICET.
2005–2011	**Licenciate in Mathematics (equivalent to M.Sc.),** Department of Mathematics, University of Buenos Aires. *Advisor*: Dr. Elías Gabriel Minian. *Thesis*: *Topology of finite spaces: an algorithmic approach.*

Research Interests

Topological Data Analysis, Applied Topology, Algebraic Topology, Combinatorial Topology, Probability and Statistics, Machine Learning, Deep Learning, Data Science, Combinatorial Optimization.

Publications and preprints

2019	*3-deformations of 2-complexes and Morse theory.* Fernández, X., Preprint. `arXiv:1912.00115` .

2018	*The Cylinder of a Relation and Generalized Versions of the Nerve Theorem.* Fernández, X. & Minian, E.G., Discrete Comput. Geom.
2016	*Homotopy colimits of diagrams over posets and variations on a theorem of Thomason.* Fernández, X. & Minian, E.G., Homology, Homotopy and Applications. vol. 18 issue 2.

Research visits

2018	*Research stay.* Department of Algebra, Geometry and Topology, University of Malaga, Spain. *Mentor:* Dr. Aniceto Murillo.

Talks in conferences and congresses

Ago 2019	*Homología Persistente para el Análisis de Datos* *Seminar of Applied Math.* FAMAF. Córdoba, Argentina.
Oct 2019	*Mathematics ft. Computer Science.* *DuraznoConf.* Universidad Tecnológica de Uruguay. Durazno, Uruguay.
Sep 2019	*Topological Data Analysis and Applications.* *PyData Córdoba 2019.* UTN, Córdoba, Argentina.
May 2019	Panel: *How to train in data science.* *Jornada de Ciencia de Datos.* FCEyN, UBA, Argentina.
Sep 2015	*New combinatorial methods for the study of the Andrews-Curtis conjecture.* *Reunión Anual de la Unión Matemática Argentina*, Facultad de Ingeniería Química, Santa Fe, Argentina.
Sep 2014	*Homotopy colimits of diagrams over posets and the Thomason's theorem.* *Reunión Anual de la Unión Matemática Argentina*, Universidad Nacional de San Luis, Argentina.
Ago 2014	*Homotopy colimits over posets.* *VII elENA, Encuentro Nacional de Álgebra*, La Falda, Córdoba, Argentina.
Dec 2013	*The Andrews-Curtis conjecture.* *XIII Encuentro Rioplatense de Álgebra y Geometría Algebraica*, Balneario Solís, Uruguay.

Sep 2013 *Reduction methods and the Andrews-Curtis conjecture.*

Reunión Anual de la Unión Matemática Argentina, Facultad de Ciencias Exactas, Ingeniería y Agrimensura de la Universidad Nacional de Rosario, Santa Fe, Argentina.

Sep 2011 *Morse Theory for posets.*

Reunión Anual de la Unión Matemática Argentina, Facultad de Ciencias Exactas y Tecnología de la Universidad Nacional de Tucumán, Argentina.

Professional experience

May 2019- Dec 2019 *Data Scientist.* Properati. OLX Group. Argentina.

I developed models for: prediction of the price of properties, recommender systems, statistical reports and data analysis. I used machine learning, deep learning and statistical tools, using as input for the models the historical data of advertisements published in the web page, and the interaction of users with the web platform. I developed software in Python and I deployed the models using Google Cloud tools.

Oct 2018- Apr 2019 *Mathematical Models Specialist.* CAMMESA. Argentina.

I was part of the project of optimization of energetic resources, developing mixed linear programming models and stochastic dynamical programming models. I also designed a model for prediction of demand of electric energy in Argentina. I used machine learning, combinatorial optimization and statistical tools. I developed software in Python, Fortran and Visual Basic. I used as input the historical data of electric production and demand, as well as external meteorological and economical features that had latent predictive qualities for this problem.

Open source projects

2019 I developed with Iván Sadofschi Costa and Kevin Piterman a GAP package associated to the poset's theory and applications related to algebraic invariants, Simple Homotopy Theory, Andrews Curtis Conjecture, Morse theory and Quillen's Conjecture.

GAP package in `https://github.com/isadofschi/posets`

Documentation in `http://mate.dm.uba.ar/~isadofschi/posets/`

2017 I developed a Python module for the open source software SAGE, associated to the finite topological spaces theory, and the algorithms developed during my doctoral research.

SAGE Module: `github.com/ximenafernandez/Finite-Spaces`

Organization of scientific congresses

2011	I was part of the local organizing committee of the WATACBA, Workshop in Algebraic Topology and Combinatorics, University of Buenos Aires, Argentina.

Research Projects

2018	MTM2016-78647-P, National Program in Math, Research project in University of Malaga, Spain, directed by Dr. Aniceto Murillo and Dr. Antonio Viruel.
2012-2015	UBACyT *Topology, discrete geometry and applications*, directed by Dr. Elías Gabriel Minian. Research student.
2012-2015	UBACyT *Combinatorial Topology*, directed by Dr. Elías Gabriel Minian. Research student.
2011-2014	UBACyT *Homotopy Theory and applications*, directed by Dr. Elías Gabriel Minian. . Research student.
2008-2011	UBACyT X146 *Algebraic fomotopu and combinatorial geometry*, directed by Dr. Elías Gabriel Minian. Research student.

Teaching

Department of Mathematics, Faculty of Exact and Natural Sciences, U.B.A.

Jan 2020 - Feb 2021 *Graduate teaching assistant and researcher*, Department of Mathematics.

Mar 2018 - Sep 2018 *Assistant professor and researcher*, Department of Mathematics.

Mar 2017 - Feb 2018 *Graduate teaching assistant and researcher*, Department of Mathematics.

Jul 2015 - Feb 2017 *Assistant professor*, Department of Mathematics.

Mar 2013 - Jun 2015 *Graduate teaching assistant*, Department of Mathematics.

Mar 2009 - Feb 2013 *Undergraduate teaching assistant*, Department of Mathematics.

Taught courses: Introduction to Algebra, Linear Algebra, Topology, Advanced Calculus, Elementary Numerical Analysis, Probability and Statistics.

Department of Mathematics, University of San Andrés

Mar 2020 - Jul 2020 *Professor*, Department of Mathematics.

Taught courses: Calculus.

Acamica Data Science School

Mar 2020 - Ago 2020 *Professor.*

Taught courses: Data Science.

Department of Mathematics, University Torcuato DiTella

Mar 2016 - Feb 2018 *Professor*, Department of Mathematics.

Taught courses: Calculus.

Department of Mathematics, Faculty of Engineering, U.B.A.

Jul 2016 - Feb 2017 *Graduate teaching assistant*, Department of Mathematics.

Taught courses: Probability theory.

Curse of admission, U.B.A.

Jul 2013 - Feb 2017 *Graduate teaching assistant*, Department of Mathematics.

May 2016 - Feb 2017 *Graduate teaching assistant*, Department of Mathematics, UBA XXI.

Mar 2012 -Jun 2013 *Undergraduate teaching assistant*, Department of Mathematics.

Mar 2007 - Jun 2010: *Undergraduate teaching assistant*, Department of Mathematics.

Taught courses: Introduction to Calculus, Introduction to Linear Algebra.

Scholarships

2018	*International Mobility Scholarship AUIP - Andalusian and Iberoamerican Universities* From 20/05/2018 to 20/06/2018. *Tutor:* Dr. Aniceto Murillo. *Workplace:* Department of Algebra, Geometry and Topology, Faculty of Exact Sciences, University of Málaga, España.
2011-2016	*CONICET PhD Scholarship.* *Advisor:* Dr. Elías Gabriel Minian.
2010-2011	*UBACyT Scholarship for finalization of career.* *Advisor:* Dr. Elías Gabriel Minian.

Other activities

2019	Book *Algebra for Engineering*. Authors: Nicolás Capitelli, Rosa Escayola, Ximena Fernández, Gerardo Rossi. To appear. EUDEBA.
2015 - 2018	Member of the jury of math olympiads in Argentina for primary and secondary school students: Olimpiada Matemática Argentina, Olimpiada Matemática Ñandú and Olimpiada de los Mateclubes.
2006 - 2018	Collaborator and speaker in different outreach events: 'Week of Math', 'Matbaires', 'Math Festival'.

Technology

- **Programming languages**: Python (professional level), R, Octave, C++ (academic level).
- **Data science tools**: Jupyter, Libraries: NumPy, Pandas, SciKit-Learn, NetworkX, Statsmodels.
- **Tools**: git, SQL, Visual Studio
- **Combinatorial optimization tools**: XPRESS solver, Mosel Language
- **OS**: Unix, Windows

Languages

Spanish (native), English (fluent).