

Carlos Ronchi

MATHEMATICIAN

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Education

École Polytechnique Fédérale de Lausanne - EPFL

PHD IN MOLECULAR LIFE SCIENCES

- Supervisor: Cathrin Brisken
- Fellow of Marie Curie actions (MSCA) - Horizon 2020

Lausanne, VD, Switzerland

Sep. 2020 - current

University of São Paulo - USP

M.SC. IN MATHEMATICS

- Supervisor: Marcio Gameiro
- GPA: 3.83/4.00

São Carlos, SP, Brazil

Aug. 2017 - Nov. 2019

Rutgers University

VISITING RESEARCH STUDENT

- FAPESP Scholarship.
- Supervisor: Konstantin Mischaikow.

Piscataway, New Jersey, USA

Jan. 2019 - Jun. 2019

Federal University of Paraná - UFPR

B.S. IN MATHEMATICS

- Got a scholarship to spend one and a half year in Germany. First six months spent in a german language course. The other one year was spent at RFW-Universität Bonn, Bonn, Germany (Apr. 2015 - Feb. 2016) taking classes.
- GPA: 93.93/100.00

Curitiba, PR, Brazil

Apr. 2013 - Jul. 2017

Research Experience

Research assistant at Brisken's lab at School of Life Sciences - EPFL

FUNDED BY ÉCOLE POLYTECHNIQUE FÉDÉRALE DE LAUSANNE (EPFL)

- Studying statistical methods and how they are applied to breast cancer samples. One of the methods is Two-Tier Mapper, a topological tool to study the shape of the data. Developing web-based tools for Two-Tier Mapper.

Lausanne, Switzerland

Jan. 2020 - August 2020

Master's student

FUNDED BY FUNDAÇÃO DE AMPARO À PESQUISA DO ESTADO DE SÃO PAULO

- Applied persistent homology to understand the protein structure and predict its stability;
- Combined machine learning and persistent homology to improve the accuracy in image classification problems.

São Carlos, Brazil

Aug. 2017 - Nov. 2020

Undergraduate researcher

FUNDED BY PROGRAMA DE ATRAÇÃO DE JOVENS TALENTOS (CSF-PAJT)

- Studied foundations of analysis and multilinear algebra;
- Studied numerical analysis methods for matrix decomposition;
- Studied and implemented both stochastic and conjugate gradient method, SVM, neural networks and logistic regression;
- Applied Convolutional Neural Networks to predict LaTeX characters.

Curitiba, Brazil

Jul. 2016 - Jul. 2017

Teaching and Outreach

EPFL

PHD STUDENT/TEACHING ASSISTANT

- Started and organize bi-weekly seminars with experts on cancer prevention. The main audience is a group of european researchers and PhD students working under the same Marie Curie grant, a highly prestigious grant awarded by EU.
- Started and organized a monthly bioinformatics journal club for newly started PhD students from the network above.
- Helped students with exercises and concepts in Numerical Analysis, a course with over 150 students.

Lausanne, Switzerland

Sep. 2020 - current

PET - Educational Project

CORE MEMBER, FUNDED BY NATIONAL GOVERNMENT

- Developed teaching resources to teach high leve mathematics to 100 high school students during one week. The topics were:
 - Number Theory and Criptograh;
 - Euclidean and Non-Euclidean geometries.
- Organized an one week long academic session for math students, with courses and invited lectures.

Curitiba, Brazil

Aug. 2013 - Jul. 2014, Mar. - Jun. 2016

Teaching Assistant - Analytic Geometry

FEDERAL UNIVERSITY OF PARANÁ

- Organized weekly meetings with students to help them and solve problems in Analytic Geometry.

Curitiba, Brazil

Mar. 2016 - Jun. 2016

Skills

Programming Languages Julia, Python, LaTeX, R, MATLAB
Portuguese (Native), English (excellent command), German (very good command), French (basic communication)

Projects

biogrowler

<https://upbri.gitlab.io/biogrowler/>

- An R package that provides tutorials and auxiliary functions on how to analyse growth measurement data.

tmap

<https://tmap.epfl.ch>

- Website with a user friendly interface to use Two-Tier Mapper, a topological tool to analyse RNA-Seq data. The source code can be found here: <https://github.com/chronchi/tmap-app>
- Developed a R package with a more user-friendly interface. (to be released)

ProteinPersistent.jl

<https://github.com/chronchi/ProteinPersistent.jl>

- Package that provides an interface for some functions of BioPython. It also calculates the persistent homology of a protein using the python package ripser.

HSP.jl

<https://github.com/chronchi/HSP.jl>

- Julia implementation of a package to calculate the optimal Hansen Solubility Parameters.

MapperMDS.jl

<https://github.com/chronchi/MapperMDS.jl>

- Mapper is an algorithm from topological data analysis that helps visualize high dimensional data. This is an implementation in Julia that particularly accepts a distance matrix as input.

PersistenceImage.jl

<https://github.com/chronchi/PersistenceImage.jl>

- Persistence image is a vectorization method for persistence diagrams. This is an implementation of the algorithm in Julia.

perscode

<https://github.com/chronchi/perscode>

- Perscode is a vectorization method for persistence diagrams. This is an implementation of the algorithm in python.

3dPD

<https://github.com/chronchi/3dPD>

- Visualization tool for optimal cycles (w.r.t. number of edges) and persistence diagrams of three-dimensional datasets.

Honors & Awards

2010	Bronze medal , National Astronomy Olympiad	<i>Curitiba, Brazil</i>
2011	Bronze medal , National Astronomy Olympiad	<i>Curitiba, Brazil</i>
2018	Best Poster Presentation , 8th Workshop of Thesis and Dissertations at ICMC - USP	<i>São Carlos, Brazil</i>

Events

Aug. 2022	43rd Annual Conference of the International Society for Clinical Biostatistics	<i>Newcastle, UK</i>
Sep. 2021	Basel Computational Biology Conference - BC2 , Estrogen signature and gene coexpression network for breast cancer stratification and survival analysis	<i>Basel, Switzerland</i>
Oct. 2019	XII Regional Topology Meeting , A topological approach to protein stability	<i>Águas de Lindóia, Brazil</i>
May 2019	Geometric Data Analysis , Persistent homology and the protein folding problem	<i>Chicago, USA</i>
Apr. 2019	Data Driven Dynamics: Algebraic Topology, Combinatorics and Analysis , Persistent homology and the protein folding problem	<i>Montreal, Canada</i>
Aug. 2018	8th Workshop of Thesis and Dissertations of ICMC , Optimal cycles and applications in machine learning	<i>São Carlos, Brazil</i>
Aug. 2018	XXI Brazilian Topology Meeting , Optimal cycles and applications in machine learning	<i>Niterói, Brazil</i>
Aug. 2018	TRIPODS Summer Bootcamp: Topology and machine learning , Optimal cycles and applications in machine learning	<i>Providence, USA</i>
Nov. 2016	Jornada de Matemática, Matemática Aplicada e Educação Matemática	<i>Curitiba, Brazil</i>
Oct. 2015	Automatic sequences, Number Theory, Aperiodic Order	<i>Delft, The Netherlands</i>
Oct. 2015	Panorama of Mathematics	<i>Bonn, Germany</i>