

Carlos Ronchi

MATHEMATICIAN

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Education

USP (University of São Paulo)

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

UFPR (Federal University of Paraná)

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, Brazil

Apr. 2013 - Jul. 2017

Research Experience

Intern at Briskens's lab at School of Life Sciences - EPFL

FUNDED BY ÉCOLE POLYTECHNIQUE FÉDÉRALE DE LAUSANNE (EPFL)

- Studying RNA-seq analysis 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.

Lausanne, Switzerland

Jan. 2020 - May 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

PET - Educational Project

CORE MEMBER, FUNDED BY NATIONAL GOVERNMENT

- Developed teaching resources to teach high level mathematics to 100 high school students during one week. The topics were:
 - Number Theory and Cryptography;
 - 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

Julia, Python, LaTeX, MATLAB

Languages

Portuguese (Native), English (108 TOEFL), German (very good command)

Projects

ProteinPersistent.jl

[HTTPS://GITHUB.COM/CHRONCHI/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](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](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](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](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](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

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>Niteroi, 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>