

# 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 methods and how they are used in breast cancer analysis.

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>

- 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.

## Honors & Awards

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

## Events

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|           |   |                               |
|-----------|---|-------------------------------|
| May. 2019 | <b>Geometric Data Analysis</b> , Persistent homology and the protein folding problem  | <i>Chicago, USA</i>           |
| Apr. 2019 | <b>Data Driven Dynamics: Algebraic Topology, Combinatorics and Analysis</b> , Persistent homology and the protein folding problem | <i>Montreal, Canada</i>       |
| Aug. 2018 | <b>8th Workshop of Thesis and Dissertations of ICMC</b> , Optimal cycles and applications in machine learning                     | <i>São Carlos, Brazil</i>     |
| Aug. 2018 | <b>XXI Brazilian Topology Meeting</b> , Optimal cycles and applications in machine learning                                       | <i>Niteroi, Brazil</i>        |
| Aug. 2018 | <b>TRIPODS Summer Bootcamp: Topology and machine learning</b> , Optimal cycles and applications in machine learning               | <i>Providence, USA</i>        |
| Nov. 2016 | <b>Jornada de Matemática, Matemática Aplicada e Educação Matemática</b>   | <i>Curitiba, Brazil</i>       |
| Oct. 2015 | <b>Automatic sequences, Number Theory, Aperiodic Order</b>  | <i>Delft, The Netherlands</i> |
| Oct. 2015 | <b>Panorama of Mathematics</b>  | <i>Bonn, Germany</i>          |