

# 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 intern at Astrazeneca

FUNDED BY MSCA - HORIZON 2020

- Academic placement to learn and get a feeling of pharmaceutical companies. Presented my research for over 70 people at both the bioscience and bioinformatics department.

Cambridge, UK

Nov. 2022 - Nov. 2022

### 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/LAB IMMERSION SUPERVISOR

- Proposed and supervised a lab immersion project for a master's student. The student worked weekly on the lab in a project involving the tool TMap.

Lausanne, Switzerland

Sep. 2022 - Dec. 2022

### EPFL

PHD STUDENT/TEACHING ASSISTANT

- Teaching assistant of genomics and bioinformatics for over 100 students in 2022 and 2023. Organized exercise sessions and students projects for the final assignments. Supervised more 10 students in the final project where they had to reproduce figures from several papers.
- 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

Curitiba, Brazil

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

- 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.

## Teaching Assistant - Analytic Geometry

FEDERAL UNIVERSITY OF PARANÁ

Curitiba, Brazil

Mar. 2016 - Jun. 2016

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

## Skills

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**Programming** R, Julia, Python, LaTeX, bash

**Languages** Portuguese (Native), English (excellent command), German (good command), French (good command)

## Papers

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### 2023

- Ronchi, C., & Briskin C. **Molecular landscape: a data integration tool for personalized medicine in Breast Cancer**. *Manuscript in preparation*.
- Ronchi, C., & Ambrosini G. & Briskin C. **biogrowler: Extracting insights from growth measurement data**. *Manuscript in preparation*.
- Ronchi, C., & Briskin, C. (2023). **Targeting the Progesterone Receptor in Breast Cancer: Mind the Short Form!** In Clinical Cancer Research (pp. OF1–OF2). American Association for Cancer Research (AACR). <https://doi.org/10.1158/1078-0432.ccr-22-3374>

## Projects

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### biogrowler

[HTTPS://UPBRI.GITLAB.IO/BIOGROWLER/](https://UPBRI.GITLAB.IO/BIOGROWLER/)

- An R package that provides tutorials and auxiliary functions on how to analyse growth measurement data.
- Package was taught in workshops and has been used by other life scientist.

### ttmap

[HTTPS://GITLAB.COM/UPBRI/TTMAP](https://GITLAB.COM/UPBRI/TTMAP)

- R package implementing Two-Tier Mapper, a topological tool to analyse RNA-Seq data.
- Developed a R package with a more user-friendly interface.
- Supervised a student that added tests and a shiny app interface to the package.

### 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

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

## Events

Feb. 2023	<b>World Cancer Day</b> , Could algorithms and computers help us with cancer prevention?	Lausanne, Switzerland
Nov. 2022	<b>Talk at AstraZeneca</b> , Understanding hormone signaling and its risks on estrogen receptor-positive breast cancer	Cambridge, UK
Aug. 2022	<b>43rd Annual Conference of the International Society for Clinical Biostatistics</b>	Newcastle, UK
Jun. 2022	<b>International workshop on cancer prevention</b> , Understanding hormone signaling and its risk on estrogen receptor-positive breast cancer	Pollone, Italy
Sep. 2021	<b>Basel Computational Biology Conference - BC2</b> , Estrogen signature and gene coexpression network for breast cancer stratification and survival analysis	Basel, Switzerland
Oct. 2019	<b>XII Regional Topology Meeting</b> , A topological approach to protein stability	Águas de Lindóia, Brazil
May 2019	<b>Geometric Data Analysis</b> , Persistent homology and the protein folding problem	Chicago, USA
Apr. 2019	<b>Data Driven Dynamics: Algebraic Topology, Combinatorics and Analysis</b> , Persistent homology and the protein folding problem	Montreal, Canada
Aug. 2018	<b>8th Workshop of Thesis and Dissertations of ICMC</b> , Optimal cycles and applications in machine learning	São Carlos, Brazil
Aug. 2018	<b>XXI Brazilian Topology Meeting</b> , Optimal cycles and applications in machine learning	Niteroi, Brazil
Aug. 2018	<b>TRIPODS Summer Bootcamp: Topology and machine learning</b> , Optimal cycles and applications in machine learning	Providence, USA
Nov. 2016	<b>Jornada de Matemática, Matemática Aplicada e Educação Matemática</b>	Curitiba, Brazil
Oct. 2015	<b>Automatic sequences, Number Theory, Aperiodic Order</b>	Delft, The Netherlands
Oct. 2015	<b>Panorama of Mathematics</b>	Bonn, Germany