

## EDUCATION

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### Washington University in St. Louis

PhD Physics Candidate (Dec. 2022) & MA Physics (Aug. 2019), GPA: 3.96

Thesis Supervisor: Dr. Alexander Seidel

**Aug. 2017 – Present**

Saint Louis, MO, USA

- Relevant Coursework: Adv. statistical physics II
- Audited classes in ML: Machine learning, Andrew NG, Stanford CS229; Statistical learning theory & applications, MIT 9.520/6.860; Fundamentals of deep learning, NVIDIA deep learning inst., (TensorFlow); Deep learning specialization, Andrew NG, Coursera.
- *Extracurricular*: Machine Learning Club; Diversity, Equity and Inclusion Committee; Physics Department Mentor.

### University of Sao Paulo

MS Physics, GPA: A

**Feb. 2015 – Jul. 2017**

Sao Carlos, SP, Brazil

- Thesis: exact and numerical calculations of quantum spin correlations.[\[link\]](#)
- Relevant Coursework: Adv. statistical physics I; Adv. Quantum Mechanics.

### University of Sao Paulo

BS Physics, GPA: 8.3/10

**Mar. 2011 – Dec. 2014**

Sao Carlos, SP, Brazil

- Relevant Coursework: Intro to computer programming (C), Numerical analysis (C), Intro to computational physics (Fortran), Wolfram programming language, Statistical physics, Linear algebra, and several other math courses, Intro to electronics.

## EXPERIENCE

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### Washington University in St. Louis

PhD Researcher and Teaching Assistant

**Aug. 2017 – Present**

Saint Louis, MO, USA

- Developed an exact algorithm to model various topological quantum states with a  $\infty$ -linked tensor network.[\[link\]](#)
- Constructed new self-consistent numerical models in *Python* for statistical inference of experimental data.
- Predicted energy levels and probability distributions of quantum states using *parallel computing* with 30x faster calculations.
- Conducted extensive data analysis of simulation and real data from experiments at the frontier of quantum physics knowledge.
- Designed graphics and schematic diagrams for data visualization using *matplotlib*, and *Mathematica*.
- Presented results at conferences to 100+ attendees.
- Teaching assistant for several courses: Statistical mechanics (graduate level); Electromagnetism II; Adv. mathematical physics I & II (graduate level); Introductory physics, etc.

### University of Sao Paulo

MSc Researcher and Teaching Assistant

**Feb. 2015 – Jul. 2017**

Sao Carlos, SP, Brazil

- Developed and applied exact and numerical algorithms to calculate statistical correlations in large quantum systems.
- Implemented gradient descent to predict asymptotic behaviors of correlations.
- Tested various numerical models to predict correlations with highly oscillating kernels.
- Teaching assistant for Electromagnetism I and Introductory physics for engineers.

### University of Sao Paulo

Undergraduate Researcher

**Jan. 2014 – Dec. 2014**

Sao Carlos, SP, Brazil

- Developed and applied exact algorithms to calculate discrete Fourier transform of correlation functions of a large spin system in the frequency domain. [Scholarship from the Sao Paulo Research Foundation.](#)

## SKILLS

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**Modeling:** statistics, stochastic calculus, data analysis, machine learning, deep learning, NumPy, pandas, PyTorch, TensorFlow, matplotlib, scikit-learn, SciPy, Mathematical modeling, parallel computing, time series

**Programming languages (YOE):** Python (5), C (1), SQL (0.2), Matlab (0.5), Fortran (1), Wolfram Mathematica (6)

**Technologies/Frameworks:** Linux, Jupyter notebooks, PyCharm, Google Colab, LaTeX, Gnuplot

**Soft skills:** Problem solving, research, detail-focused, self learning, teamwork, communication, teaching

## ADDITIONAL PROJECTS

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**Machine Learning projects** | PyTorch, TensorFlow, scikit-learn, SciPy, Pandas, Numpy **Feb. 2018 – Present**

- Predicted among 15,000 customers the most likely ones to churn based on their transaction activity history over a two years period by employing K-means algorithm to cluster businesses according to their attributes. [[GitHub](#)]
- Studied computer vision, natural language processing, and other ML and DL algorithms in small real-world projects using PyTorch, TensorFlow, scikit-learn, and SciPy.

**Robinhood account activity data to Glacier Tax application** [[GitHub](#)] | Python, pandas **March 2020**

- Created an app in python for cleaning and processing account activity data from Robinhood to be uploaded to Glacier Tax. The application finds and matches stocks that were sold in 2020 with stocks previously bought to calculate the profit and ultimately income taxes for stocks for nonresident aliens. It also exports the data in the format required to be uploaded into glaciertax.com. I recently started building an API using Flask and Python for better automation.

**Fluctuation relations** [[GitHub](#)] | statistics, physics **Nov. 2018 – Dec. 2018**

- Derived the Jarzynski equality fluctuation relation. It connects equilibrium states with non-equilibrium states for various systems by properly accounting the noise for each sample of the ensemble of non-equilibrium trajectories space. Links with machine learning algorithms are pointed out.

## TALKS AND EVENTS

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• **Duke Machine Learning Winter School: Computer Vision (MLWS-CV)** | *PyTorch, CNN's* **Jan. 2022**

• **Conference on Neural Information Processing Systems (NeurIPS 2021)** **Dec. 2021**

• March Meeting 2021, APS, online, *Fractional quantum Hall states: frustration-free parent* **Mar. 2021**

*Hamiltonians and infinite-bond-dimension matrix-product-states*

• March Meeting 2020, APS, online, *From CFT matrix product states to parent Hamiltonians* **Mar. 2020**

• National high magnetic field laboratory winter school, Tallahassee FL, *From CFT matrix product* **Jan. 2020**

*states to FQHS parent Hamiltonians*

• March Meeting 2019, APS, *A recursion approach to thin cylinder approximants for fractional quantum* **Mar. 2019**

*Hall states*

• Workshop on Quantum Non-Equilibrium Phenomena, IIP-UFRN, *Dynamical correlation functions of* **Jun. 2016**

*a two-spin operator in quantum spin chains*

## PUBLICATIONS

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• M. Schossler, *et al.* *Theoretical description of the Cyclotron Resonance in Dual-Gated Bilayer Graphene.* [[in progress](#)]

• M. Schossler, *et al.* *The inner workings of fractional quantum Hall parent Hamiltonians: An MPS point of view.* 2021. [[link](#)]

• M. Schossler, M.Sc. thesis. University of Sao Paulo, Sao Carlos, 2017. *Dynamics of two-spin operators in the XX model.* [[link](#)]

• Six conference proceedings. APS March Meeting 2019, 2020 & 2021. Physics Week, USP, Sao Carlos, 2014 & 2015. [[scholar](#)]

## HONORS & AWARDS

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• Award *IFT-ICTP-SAIFR Young Physicist* (South American competition), 4th place, IFT-UNESP, **Mar. 2016**  
Sao Paulo.

• [Scholarship 15/05644-9](#) - Masters grant. Sao Paulo Research Foundation (FAPESP). *Time-dependent* **Sept. 2015**  
*correlations of tensor operators in quantum spin chains.*

• Prize *Yvonne Primerano Mascarenhas* for best presentation, 2nd place, undergraduate physics week, **Oct. 2014**  
IFSC, University of Sao Paulo.

• [Scholarship 13/21168-7](#) - Scientific Initiation grant. Sao Paulo Research Foundation (FAPESP). **Jan. 2014**  
*Dynamics of two-body operators in exactly solvable spin chains.*

• *Bronze Medal*, Brazilian Olympics of astronomy and astronautics (OBA!), Ministry of Education, **May. 2010**  
Brazil.

## VOLUNTEERING

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BJC HealthCare, as **Data Manager**; St. Louis Inter-Faith Committee on Latin America (IFCLA) & Prof. Sebastiao de Oliveira Rocha, public state high school, as **English/Portuguese translator**.