Gabriel Oliveira Alves

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Summary

Masters student at the University of São Paulo. Several years of experience in quantum information, quantum thermodynamics and quantum computing. Publications in the fields of quantum thermometry and holonomic quantum computing. Programming experience with Mathematica, Python, C++ and Haskell. Experience in functional programming approaches using Mathematica and Haskell and brief experience in machine learning.

Experience

UNIVERSITY OF UPPSALA | Erasmus Exchange Student

Sep 2021 – Jan 2022 | Uppsala, Sweden

- I have worked under the supervision of Prof. Dr. Erik Sjöqvist on a project entitled time-optimal holonomic quantum computation, where we studied optimal implementations of non-adiabatic holonomic quantum gates. We studied the trade-off in the gate operation time when considering open quantum system effects and counter-rotating corrections in the gate Hamiltonian.

UNIVERSITY OF SÃO PAULO | Master's Student

Aug 2020 – Present | São Paulo

- I have been working on quantum metrology and quantum thermometry under the supervision of Prof. Dr. Gabriel Teixeira Landi. In particular, we have employed tools from Bayesian inference in collisional quantum thermometry. We are also interested in extending the protocol to Gaussian states.

UNIVERSITY OF SÃO PAULO | Undergraduate Researcher

Aug 2018 – Aug 2020 | São Paulo

- In my undergraduate research project I studied stochastic differential equations, with a particular focus on their numerical treatment, and quantum (dissipative) phase transitions in the quantum Rabi Model.
- I took the following courses at graduate level: Machine Learning, Quantum Mechanics I & II, Quantum Field Theory I, Quantum Information and Quantum Noise, Stochastic Dynamics, Statistical Mechanics, Classical Mechanics

FEDERAL INSTITUTE OF SÃO PAULO

2013-2015 | São Paulo

- I worked under the supervision of Prof. Dr. Marcio Yuji Matsumoto on a high-school research project entitled development of a low-cost scanning tunnelling microscope . We developed an interface written in C++ between an Arduino micro-controller and an electrical circuit in order to plot the experimentally acquired data.

Skills

PROGRAMMING

Proficient:
Mathematica

Experienced:
Python • C++ • Haskell

Familiar:
C • Shell • HTML/CSS

LIBRARIES/FRAMEWORKS

Numpy • Manim • Pandas • OpenGL • Flask • OpenCV

TOOLS/PLATFORMS

Jupyter • Arduino • SolidWorks • Fusion360 • 3D Printing • Git • LaTeX

Education

UNIVERSITY OF SÃO PAULO

MSc. in Quantum Information and Quantum Thermodynamics
Aug 2020 - Present | São Paulo

UNIVERSITY OF SÃO PAULO

BSc. in Molecular Sciences - Emphasis in Physics
Aug 2016 - Aug 2020 | São Paulo

FEDERAL INSTITUTE OF SÃO PAULO

Certificate in Electronics
2013 - 2015 | São Paulo

Publications

• G. O. Alves and E. Sjöqvist, **Time-optimal holonomic quantum computation**, ArXiv (2022).

• R. C. Ceccato, G. O. Alves, D. S. Fomin, L. E. F. Junior, T. N. Frederico and H. T. Moriya, **Development of a Low-Cost Video Laryngoscope**, (Submitted - pending approval) (2022).

• G. O. Alves and G. T. Landi, **Bayesian Estimation for Collisional Thermometry**, Phys. Rev. A 105, 012212 (2022).

Projects

ONLINE NOTES | Various

2015-Present

➔ I have been uploading some notes on physics and computer sciences topics for a few years. For instance, I have created and contributed to the entries on the greedy algorithms for backpack problem and the egg dropping puzzle at Brilliant.org. I recently started uploading some of these notes to my personal website (see e.g. this link and also my notes).

MANIM PROJECTS | Python, Manim

2021 - Present

➔ I have been using the Manim library in order to create high-quality animations using Python. These animations are typically used in diagrams for presentations and research projects. Check this repository and this link (in the tab Manim) for some samples.

LOW-COST VIDEO LARYNGOSCOPE | Python, Flask, OpenCV, Fusion360

2020-2022

➔ Development of a video laryngoscope. We built a 3D-printed body for the equipment, a Raspberry-Pi was used as the processing unit and the software was developed in Python. We used OpenCV to capture the video, while Flask was used to store and stream the data remotely.

ARDUINO VIDEOGAME | C++, Arduino

2015

➔ My electronics course thesis. I developed a home-bred video-game console (both the software and the hardware), which ran Tetris and Pong. The games, sound and the interface were all programmed from scratch using C++ and Arduino.

FLIGHT SIMULATION GEAR | C++, Arduino, SolidWorks

2019-Present

➔ Development of a flight cockpit using 3D-printed materials. The interface between the electronics and the software was built using Arduino and C++

Awards

Brazilian Physics Olympiad	2013 (Silver), 2014 (Silver), 2015 (Silver)
Brazilian Astronomy Olympiad	2013 (Silver), 2014 (Silver), 2015 (Gold)
Brazilian Physics Olympiad for Public Schools	2013 (Gold), 2014 (Gold)
Math Kangaroo Olympiad	2014 (Silver)
Brazilian Robotics Olympiad	2015 (Silver)
Brazilian Mathematics Olympiad for Public Schools	2014 (Mention), 2015 (Bronze)
IYPT (Brazilian Edition)	2015 (Mention)

Courses and Workshops

• **Quantum Thermodynamics 2022 (online)** - June 2022 | Poster Presentation - Bayesian estimation for collisional thermometry

• **Quantum Thermodynamics Summer School - Les Diablerets, Switzerland (online)** - August 2021 | Poster Presentation - Bayesian estimation for collisional thermometry

• **Brazilian Autumn Meeting** - June 2021 | Talk - Bayesian estimation for collisional thermometry

• **A mini-course on Quantum-Information Thermodynamics** - November 2020

• **Paraty Quantum Information School** - August 2019 | Poster Presentation - The Critical Rabi Model

• **Brazilian Physics Society Autumn Meeting** - May 2019 | Poster Presentation - The Critical Rabi Model

• **Minicourse on Quantum Entanglement: From Quantum Information to Many-Body Physics and Beyond**
ICTP-SAIFR/IFT-UNESP - August 2018

Languages

Portuguese	Native
English	Fluent
German	Intermediate comprehension
Japanese	Intermediate comprehension (JLPT N2 - 2019)

References

Dr. Gabriel T. Landi, University of São Paulo
✉ gtlandi@gmail.com

Dr. Erik Sjöqvist, University of Uppsala
✉ erik.sjoqvist@physics.uu.se

Dr. Marcio Yuji Matsumoto, Federal Institute of São Paulo
✉ marciomoto@yahoo.com.br