# Nickolas de Aguiar Alves

PhD student in theoretical physics
Federal University of ABC
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## Education

2023 – Ongoing
**Doctor in Physics**
Federal University of ABC (UFABC), SP, Brazil
Advisor: Prof. André G. S. Landulfo

2021 – 2023
**Master in Physics**
Federal University of ABC (UFABC), SP, Brazil
Advisor: Prof. André G. S. Landulfo
Thesis: *Nonperturbative Aspects of Quantum Field Theory in Curved Spacetime*

2017 – 2021
**Bachelor in Physics**
Institute of Physics, University of São Paulo (IFUSP), SP, Brazil
Advisor: Prof. João C. A. Barata

## Academic Publications

### Journal Articles

1. **N. de Aguiar Alves**, A. G. S. Landulfo, and B. A. Costa. "Positive Mass in General Relativity Without Energy Conditions". *Physical Review D* (2025). arXiv: 2408.00154 [gr-qc]. Forthcoming.

### Theses

1. **N. de Aguiar Alves**. "Nonperturbative Aspects of Quantum Field Theory in Curved Spacetime". MSc thesis. Santo André, Brazil: Federal University of ABC, 2023. xxiv, 152 pp. arXiv: 2305.17453 [gr-qc].

### To Appear

1. **N. de Aguiar Alves**. *Lectures on the Bondi–Metzner–Sachs Group and related topics in infrared physics*. In preparation.
2. **N. de Aguiar Alves**. *Measurements Are Never Relative*. Submitted.
3. **N. de Aguiar Alves**, A. G. S. Landulfo, and A. D. Pereira. *Nonperturbative Renormalization Group Flow for a Particle Detector*. In preparation.

## Funding

2023 – Ongoing
PhD Scholarship
Coordenação de Aperfeiçoamento do Pessoal de Ensino Superior (CAPES)
Granted to pursue my PhD degree after placing first in UFABC's admission ranking

2021 – 2023
MSc Scholarship
São Paulo Research Foundation (FAPESP) Grant No. 2021/07372-7
Project: The Functional Renormalization Group in Quantum Field Theory in Curved Spacetimes
Advisor: Prof. André G. S. Landulfo

2021
MSc Scholarship
Coordenação de Aperfeiçoamento do Pessoal de Ensino Superior (CAPES)
Granted to pursue my MSc degree after placing first in UFABC's admission ranking

## Funding (continued)

2019 – 2020
BSc Scholarship
São Paulo Research Foundation (FAPESP) Grant No. 2019/12158-4
Project: Hyperbolic Equations
Advisor: Prof. João C. A. Barata

## Academic Service

### Conferences Organized

2023
Golden Wedding of Black Holes and Thermodynamics
Main organizer

### Schools Organized

2024
I São Paulo School in Gravitational Physics
Main organizer

2018 – 2021
Jayme Tiomno School in Theoretical Physics
Founder and organizer of the first three editions

### Miscellaneous

2018
Dead Physicists Society
Founded a student-driven organization still responsible for the organization of schools and seminars at IFUSP

2017 – Ongoing
Organized several other events, seminars, and colloquia

## Scientific Societies

2025 – Ongoing
Brazilian Physical Society

2024 – Ongoing
International Society for Quantum Gravity

## Teaching Experience

### Minicourses and Workshops

2024
Infrared Symmetries of General Relativity
I São Paulo School in Gravitational Physics
10-hour-long minicourse for advanced undergraduate and early graduate students

2023
Quantum Field Theory in Curved Spacetime
Golden Wedding of Black Holes and Thermodynamics
12-hour-long minicourse for early graduate students

2021
Algebraic Methods of Theoretical Physics
III Jayme Tiomno School in Theoretical Physics
10-hour-long minicourse for first-year undergraduate students on the basics of group theory and its applications to physics

2020
An Introduction to LaTeX
XV Oceanography Thematic Week
Oceanographic Institute, University of São Paulo

2019
An Introduction to LaTeX
I Jayme Tiomno School in Theoretical Physics

## Teaching Experience (continued)

### Teaching Assistant

2024 — Electromagnetic Phenomena
Federal University of ABC, SP, Brazil
Undergraduate-level course covering introductory electrodynamics
Hosted office hours twice a week

2021 — Classical Mechanics II
Federal University of ABC, SP, Brazil
Undergraduate-level course covering analytical mechanics
Hosted office hours twice a week

2019 — Mathematical Physics I
Institute of Physics, University of São Paulo, SP, Brazil
Undergraduate-level course covering introductory Fourier analysis
Hosted office hours twice a week

### Outreach and Miscellanea

2023 – Ongoing — gravitonick
https://www.youtube.com/@gravitonick
YouTube channel discussing advanced physics topics aimed at undergraduate students

2018 – Ongoing — Physics Stack Exchange
Active contributor to the Physics Stack Exchange Q&A website
Most prolific contributor to the `qft-in-curved-spacetime` tag

2018 – 2020 — Informal office hours
Hosted "informal office hours" twice a week for first-year students at IFUSP

## Research Presentations

### Contributed Talks

2024 — Positive mass in general relativity without energy conditions

- XLVII Paulo Leal Ferreira Congress (São Paulo State University, São Paulo, Brazil)

2023 — Nonperturbative renormalization group flow for a particle detector

- Golden Wedding of Black Holes and Thermodynamics (online conference)

### Poster Presentations

2024 — Negative masses are unstable and we don't need energy conditions to prove it

- Witnessing Quantum Aspects of Gravity in a Lab (Principia Institute, São Paulo, Sep. 23–27, 2024)

2023 — Nonperturbative aspects of quantum field theory in curved spacetime

- Interfaces Between Quantum and Classical Statistical Mechanics (University of São Paulo's Institute of Mathematics and Statistics, Jul. 24–28 2023)
- V Jayme Tiomno Physics School (University of São Paulo's Institute of Physics, Sep. 4–8, 2023)
- XLVI Paulo Leal Ferreira Congress (São Paulo State University's Institute of Theoretical Physics, Oct. 24–27, 2023)

## Research Presentations (continued)

### Flash Talks

2023 – 2024 Nonperturbative renormalization group flow for a particle detector

- School on Phase Transitions and Gravitational Waves (Federal University of Rio Grande do Norte's International Institute of Physics, Mar. 4–8, 2024)
- Quantum Spacetime and the Renormalization Group 2023 (Sant'Elmo Beach Hotel, Oct. 2–6, 2023)