







Níckolas de Aguiar Alves

PhD student in physics
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Education

- 2023 – Ongoing  **Doctor in Physics**
Federal University of ABC (UFABC), Santo André, São Paulo, Brazil
Advisor: Prof. André G. S. Landulfo 
- 2021 – 2023  **Master in Physics**
Federal University of ABC (UFABC), Santo André, São Paulo, 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), São Paulo, São Paulo, Brazil
Advisor: Prof. João C. A. Barata 

Academic Publications

Papers and Preprints

- 1 **N. Aguiar Alves** and A. G. S. Landulfo. “The Sky as a Killing Horizon”. (2025). arXiv: [2504.12514 \[gr-qc\]](#). Pre-published.
- 2 **N. Aguiar Alves** and B. A. Costa. “The Measure of a Mass”. (2025). Essay written for the Gravity Research Foundation 2025 Awards for Essays on Gravitation. arXiv: [2503.18963 \[gr-qc\]](#). Pre-published.
- 3 **N. Aguiar Alves**, A. G. S. Landulfo, and B. A. Costa. “Positive Mass in General Relativity Without Energy Conditions”. *Physical Review D* **111**, 044027 (2025). arXiv: [2408.00154 \[gr-qc\]](#).


Other Works

- 1 **N. Aguiar Alves**. *Lectures on the Bondi–Metzner–Sachs Group and related topics in infrared physics*. 2025. arXiv: [2504.12521 \[gr-qc\]](#). Pre-published.
- 2 **N. 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. Aguiar Alves**. *Black Holes for First-Time Physicists*. In preparation.
- 2 **N. Aguiar Alves**. *Measurements Are Never Relative*. In preparation.
- 3 **N. Aguiar Alves**, A. G. S. Landulfo, and A. D. Pereira. *Nonperturbative Renormalization Group Flow for a Particle Detector*. In preparation.
- 4 **N. Aguiar Alves** and C. C. Rodrigues. *The Platypus Spacetime: An Example of Gravity Without Mass in General Relativity*. In preparation.

Funding



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

Funding (continued)




- 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 de Pessoal de Ensino Superior](#) (CAPES)
Granted to pursue my MSc after placing first in UFABC's admission ranking
- 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

- 2026 (planned)  Thermality in Quantum Field Theory in Curved Spacetimes
Main organizer
- 2023  [Golden Wedding of Black Holes and Thermodynamics](#)
Main organizer

Schools Organized

- 2025 (planned)  [II São Paulo School in Gravitational Physics](#)
Main organizer
- 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





Teaching Experience (continued)

- 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 Assistant


- 2025  Advanced Topics in General Relativity
Institute of Physics, University of São Paulo, SP, Brazil
Graduate-level course covering advanced topics in general relativity
Office hours twice a week (voluntary)
- 2024  Electromagnetic Phenomena
Federal University of ABC, SP, Brazil
Undergraduate-level course covering introductory electrodynamics
Office hours twice a week
- 2021  Classical Mechanics II
Federal University of ABC, SP, Brazil
Undergraduate-level course covering analytical mechanics
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
Office hours twice a week

Outreach and Miscellanea


- 2025  [International Young Physicists Tournament \(Brazil\)](#)
Juror for the final stage of the 2025 edition of the IYPT Brazil.
-  [V ICTP-SAIFR Summer School for Young Physicists](#)
Tutored a course on black hole physics for high school students
- 2023 – Ongoing  [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)


Research Presentations (continued)

- 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)

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)