Níckolas de Aguiar Alves

PhD candidate in physics
Federal University of ABC
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Education

2023– **Doctor in Physics**
Federal University of ABC (UFABC), Santo André, São Paulo, Brazil
Advisor: André G. S. Landulfo

2021–2023 **Master in Physics**
Federal University of ABC (UFABC), Santo André, São Paulo, Brazil
Advisor: 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: João C. A. Barata

Academic Publications

Papers and Preprints

1. **N. Aguiar Alves** and A. G. S. Landulfo. "Null infinity as a Killing horizon". *Physical Review D* **112**, 065017 (2025). arXiv: 2504.12514 [gr-qc].
2. **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]. Submitted.
2. **N. Aguiar Alves** and B. A. Costa. *The Measure of a Mass*. 2025. arXiv: 2503.18963 [gr-qc].
3. **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**, C. C. Rodrigues, and G. J. Olmo. *Platypus stars: Exotic compact objects supported by vacuum pressure*. In preparation.

Funding

2025– PhD Scholarship
São Paulo Research Foundation (FAPESP) Grant No. 2025/05161-0
Project: The Sky as a Killing Horizon and Other Topics on the Infrared Structure of Gravity
Advisor: André G. S. Landulfo

2023–2025 PhD Scholarship
Coordenação de Aperfeiçoamento do 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: André G. S. Landulfo

2021 — MSc Scholarship
Coordenação de Aperfeiçoamento do 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: João C. A. Barata

Academic Service

Conferences Organized

2026 (scheduled) — Thermality in Quantum Field Theory in Curved Spacetimes
Main organizer
Supported by the ICTP South American Institute for Fundamental Research

2023 — Golden Wedding of Black Holes and Thermodynamics
Main organizer

Schools Organized

2025 — II São Paulo School in Gravitational Physics
Main organizer
Part of ICTP Physics Without Frontiers

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

Scientific Societies

2025– Brazilian Physical Society

2024– International Society for Quantum Gravity

Teaching Experience

Minicourses and Workshops

2025 — Introduction to Black Hole Physics
II São Paulo School in Gravitational Physics
Minicourse for early undergraduate students

2024 — Infrared Symmetries of General Relativity
I São Paulo School in Gravitational Physics
Minicourse for advanced undergraduate and early graduate students

2023 — Quantum Field Theory in Curved Spacetime
Golden Wedding of Black Holes and Thermodynamics
Minicourse for early graduate students

Teaching Experience (continued)

2021 — Algebraic Methods of Theoretical Physics
III Jayme Tiomno School in Theoretical Physics
Minicourse on group theory in physics for first-year undergraduate students

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 — Topics in Celestial Holography
Institute of Physics, University of São Paulo
Graduate-level course

Advanced Topics in General Relativity
Institute of Physics, University of São Paulo
Graduate-level course

2024 — Electromagnetic Phenomena
Federal University of ABC
Undergraduate-level course covering introductory electrodynamics

2021 — Classical Mechanics II
Federal University of ABC
Undergraduate-level course covering analytical mechanics

2019 — Mathematical Physics I
Institute of Physics, University of São Paulo
Undergraduate-level course covering introductory Fourier analysis

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

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