

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

- 1 N. Aguiar Alves. “Lectures on the Bondi–Metzner–Sachs group and related topics in infrared physics”. *Eur. Phys. J. C* (2026). arXiv: [2504.12521 \[gr-qc\]](https://arxiv.org/abs/2504.12521). In press.
- 2 C. C. Rodrigues Evangelista and N. Aguiar Alves. “Using thermodynamics to learn gravitational wave physics”. *Eur. J. Phys.* (2026). Forthcoming.
- 3 N. Aguiar Alves and A. G. S. Landulfo. *Sound as a gauge theory and its infrared triangle*. 2025. arXiv: [2512.15796 \[hep-th\]](https://arxiv.org/abs/2512.15796). Pre-published.
- 4 N. Aguiar Alves and A. G. S. Landulfo. “Null infinity as a Killing horizon”. *Phys. Rev. D* **112**.6, 065017 (2025). arXiv: [2504.12514 \[gr-qc\]](https://arxiv.org/abs/2504.12514).
- 5 N. Aguiar Alves and B. A. Costa. *The Measure of a Mass*. 2025. arXiv: [2503.18963 \[gr-qc\]](https://arxiv.org/abs/2503.18963). Pre-published.
- 6 N. Aguiar Alves, A. G. S. Landulfo, and B. A. Costa. “Positive mass in general relativity without energy conditions”. *Phys. Rev. D* **111**.4, 044027 (2025). arXiv: [2408.00154 \[gr-qc\]](https://arxiv.org/abs/2408.00154).
- 7 N. Aguiar Alves. “*Quantum Field Theory in Curved Spacetime. An Introduction*”. Unpublished lecture notes. 2023.
- 8 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 \[gr-qc\]](https://arxiv.org/abs/2305.17453).

To Appear

- 1 N. Aguiar Alves, C. C. Rodrigues Evangelista, G. J. Olmo, and D. Rubiera-Garcia. *Platypus stars: Exotic compact objects supported by vacuum pressure*. In preparation.

Funding

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

Funding (continued)

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| 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 |
| 2021–2023 | ■ MSc Scholarship
The Functional Renormalization Group in Quantum Field Theory in Curved Spacetimes
São Paulo Research Foundation (FAPESP) Grant No. 2021/07372-7
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
Hyperbolic Equations
São Paulo Research Foundation (FAPESP) Grant No. 2019/12158-4
Advisor: João C. A. Barata  |

Academic Service

Conferences Organized

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| 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

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| 2024– | ■ São Paulo School in Gravitational Physics
Main organizer
Part of ICTP Physics Without Frontiers (second edition onward) |
| 2018–2021 | ■ Jayme Tiomno School in Theoretical Physics
Founder and organizer of the first three editions |

Scientific Societies

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| 2025– | ■ Brazilian Physical Society |
| 2024– | ■ International Society for Quantum Gravity |

Teaching Experience

Minicourses and Workshops

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| 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 L^AT_EX
[XV Oceanography Thematic Week](#)
Oceanographic Institute, University of São Paulo
- 2018  An Introduction to L^AT_EX
[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

Participation in Panels

- 2026  VI ICTP-SAIFR Summer School for Young Physicists
Panel with graduate students in physics

Outreach and Miscellanea

-  VI ICTP-SAIFR Summer School for Young Physicists
Tutored a course on black hole physics for high school students
- 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

Research Presentations

Invited Talks

- 2026 (scheduled)  Sound as a gauge theory and its infrared triangle
 - [Simon's Collaboration on Celestial Holography Zoom Seminars \(10 Mar. 2026\)](#)
- 2025  The sky as a Killing horizon
 - [Siembra-HoLAGrav Future of Physics \(08 May 2025\)](#)

Research Presentations (continued)

Contributed Talks

- 2024  Quantum Gravity and the Night Sky
 - [UFABC Physics Week](#) (Federal University of ABC, 14–17 Oct. 2025)
 - “Outstanding Recognition” award (awarded to 12 out of 45 participants)
 - Positive mass in general relativity without energy conditions
- 2023  Nonperturbative renormalization group flow for a particle detector
 - [Golden Wedding of Black Holes and Thermodynamics](#) (online conference, 04–08 Dec. 2023)

Poster Presentations

- 2025  Linear sound has asymptotic symmetries
 - [XI QCD Meets Gravity Conference](#) (Principia Institute, 15–19 Dec. 2025)
 - [XI QCD Meets Gravity School](#) (Institute of Theoretical Physics, São Paulo State University, 08–12 Dec. 2025)
- 2024  Stars with extreme pressures can mimic black holes
 - [XLVIII Paulo Leal Ferreira Congress](#) (Institute of Theoretical Physics, São Paulo State University, 14–17 Oct. 2025)
- 2023  Killing horizons naturally define asymptotic symmetries
 - [First International Latin American Conference on Gravitational Waves](#) (National Institute for Space Research, 15–19 Sep. 2025)
 - [VI Siembra-HoLAGrav Young Frontiers Meeting at ICTP-SAIFR](#) (Institute of Theoretical Physics, São Paulo State University, 30 June–11 July 2025)
 - [Program on Anomalies, Topology and Quantum Information in Field Theory and Condensed Matter Physics](#) (Principia Institute, 16–27 June 2025)
- 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, 23–27 Sep. 2024)
- 2023  Nonperturbative aspects of quantum field theory in curved spacetime
 - [XLVI Paulo Leal Ferreira Congress](#) (Institute of Theoretical Physics, São Paulo State University, 24–27 Oct. 2023)
 - [V Jayme Tiomno Physics School](#) (Institute of Physics, University of São Paulo, 4–8 Sep. 2023)
 - [Interfaces Between Quantum and Classical Statistical Mechanics](#) (Institute of Mathematics and Statistics, University of São Paulo, 24–28 July 2023)

Flash Talks

- 2023–2024  Nonperturbative renormalization group flow for a particle detector
 - [School on Phase Transitions and Gravitational Waves](#) (International Institute of Physics, Federal University of Rio Grande do Norte, 4–8 Mar. 2024)
 - [Quantum Spacetime and the Renormalization Group 2023](#) (Sant’Elmo Beach Hotel, 2–6 Oct. 2023)