

# Níckolas de Aguiar Alves

PhD candidate in physics

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## Education

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|-----------|--|
| 2023–     |  <b>Doctor in Physics</b><br>Federal University of ABC (UFABC), Santo André, São Paulo, Brazil<br>Advisor: André G. S. Landulfo    |
| 2021–2023 |  <b>Master in Physics</b><br>Federal University of ABC (UFABC), Santo André, São Paulo, Brazil<br>Advisor: André G. S. Landulfo <br>Thesis: <i>Nonperturbative Aspects of Quantum Field Theory in Curved Spacetime</i> |
| 2017–2021 |  <b>Bachelor in Physics</b><br>Institute of Physics, University of São Paulo (IFUSP), São Paulo, São Paulo, Brazil<br>Advisor: João C. A. Barata   |

## Academic Publications

- 1 **N. Aguiar Alves**. “Lectures on the Bondi–Metzner–Sachs group and related topics in infrared physics”. *The European Physical Journal C. Particles and Fields* (2026). arXiv: [2504.12521 \[gr-qc\]](https://arxiv.org/abs/2504.12521). Forthcoming.
- 2 **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.
- 3 **N. Aguiar Alves** and A. G. S. Landulfo. “Null infinity as a Killing horizon”. *Physical Review D* **112**.6, o65017 (2025). arXiv: [2504.12514 \[gr-qc\]](https://arxiv.org/abs/2504.12514).
- 4 **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.
- 5 **N. Aguiar Alves**, A. G. S. Landulfo, and B. A. Costa. “Positive mass in general relativity without energy conditions”. *Physical Review D* **111**.4, o44027 (2025). arXiv: [2408.00154 \[gr-qc\]](https://arxiv.org/abs/2408.00154).
- 6 **N. Aguiar Alves**. “*Quantum Field Theory in Curved Spacetime. An Introduction*”. Unpublished lecture notes. 2023.
- 7 **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

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|-----------|--|
| 2025–     |  PhD Scholarship<br>The Sky as a Killing Horizon and Other Topics on the Infrared Structure of Gravity<br><i>São Paulo Research Foundation</i> (FAPESP) Grant No. <a href="#">2025/05161-0</a><br>Advisor: André G. S. Landulfo  |
| 2023–2025 |  PhD Scholarship<br><i>Coordenação de Aperfeiçoamento do Pessoal de Ensino Superior</i> (CAPES)<br>Granted to pursue my PhD after placing first in UFABC’s admission ranking  |

## Funding (continued)

- 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

- 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

- 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

- 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
- 2021  Algebraic Methods of Theoretical Physics  
[III Jayme Tiomno School in Theoretical Physics](#)  
Minicourse on group theory in physics for first-year undergraduate students

## Teaching Experience (continued)

- 2020  An Introduction to L<sup>A</sup>T<sub>E</sub>X  
[XV Oceanography Thematic Week](#)  
Oceanographic Institute, University of São Paulo
- 2018  An Introduction to L<sup>A</sup>T<sub>E</sub>X  
[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