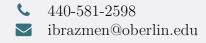
# Iago B. Mendes

# Computational Physicist



#### Education

#### B.A. in Physics & Computer Science, Oberlin College

2021 - 2025

GPA: 4.01 / 4.00

Awarded the *Highest Honors* distinction for Senior Honors Thesis

Recipient of the Robert Weinstock Prize for Outstanding Achievement in Physics Coursework

## Research Experience

#### Parameter Control in Binary Black Hole Initial Data, Caltech

2024 - Present

Caltech's Summer Undergraduate Research Fellowship (SURF)

Mentors: Nils Vu, Mark Scheel, Saul Teukolsky

Worked with the SpECTRE code to enforce physical parameters (masses, spins, etc.) in simulations. Implemented the computation of total energy, momenta and center of mass as ADM infinite integrals. Developed a root-finding scheme that controls simulation parameters using Broyden's method.

#### Isometric Embeddings of Black Hole Horizons, Oberlin College

2021 - Present

Mentor: Robert Owen

Developed a new approach to solve the PDEs needed to embed 2-surfaces into 3-Euclidean space. Implemented our algorithm in a finite-difference C++ code & in the Spectral Einstein Code (SpEC). Ran binary black hole merger simulations, gaining insight into the behavior of horizon embeddability.

## Determination of Air Viscosity via a Damped Oscillator, IFNMG, Brazil

2019 - 2021

Mentor: Marcos Carvalho

Designed an experimental spring-mass system to determine air viscosity for educational purposes. Wrote MATLAB scripts that fitted the system's motion based on previously established models.

# **Publications**

- 1. **Iago B. Mendes**, Nils L. Vu, Harald P. Pfeiffer, Oliver Long, and Robert Owen. "Parameter control for binary black hole initial data" (2025). *In preparation*.
- 2. **Iago B. Mendes**, Hengrui Zhu, and Robert Owen. "Isometric Embeddings of Numerical Horizons" (2025). *In preparation*.
- 3. **Iago B. Mendes**, Hengrui Zhu, and Robert Owen. "EuclED: A Code for Isometric Embeddings of 2-Surfaces into 3-Euclidean Space" (2025). *In preparation*.
- 4. Geoffrey Lovelace, Kyle C. Nelli, and 29 co-authors (including **Iago B. Mendes**). "Simulating binary black hole mergers using discontinuous Galerkin methods" (2024). *Accepted in Classical and Quantum Gravity.* arxiv:2410.00265.
- 5. Mendes, Iago. "Isometric Embeddings of Black Holes: Numerical Horizons in Euclidean Space" (2024). Oberlin College Honors Papers, 914. https://digitalcommons.oberlin.edu/honors/914
- 6. Mendes, I. B.; Alkimim, H. D. S.; Mota, G. O.; Carvalho, M. A. D. "Exploring the viscosity of air through a damped oscillator" (2021). Annals of Scientific Initiation Seminar of IFNMG, ISSN 2238-085X, p. 1012. https://ifnmg.edu.br/seminarios-sic.

## Conference Presentations

- 1. "Parameter Control of Binary Black Hole Initial Data", APS Global Physics Summit 2025
- 2. "Isometric Embeddings in Binary Black Hole Merger Simulations", APS April Meeting 2024
- 3. "Black Holes in Euclidean Space", State University of Montes Claros, Brazil (2024)
- 4. "Testing a new algorithm for isometric embedding of black hole horizons", APS April Meeting 2023

# Teaching & Employment

Teaching & Employment	
Instructor of General Relativity, Oberlin College's program of student-taught courses	2024
Teaching Assistant for Physics & Computer Science, Oberlin College	2022 - 2024
Courses: Mechanics & Relativity, Electromagnetism & Thermodynamics, Programmin	~
Resident Assistant at the Underrepresented in STEM House, Oberlin College	2022 - 2025
Grader for Physics & Mathematics, Oberlin College	2021 - 2025
Courses: Quantum Mechanics, Statistical Mechanics, Multivariable Calculus	0000
Software Engineer Intern at Google, Wear OS team  Head Lava and C++ to develop features on the Android energting system for smarter	2023
Used Java and C++ to develop features on the Android operating system for smartwa Worked on three parts of the codebase, completing two additional projects beyond the	
Collaborated with my team and others, including managers, input engineers, and UX	_
Training Software Engineer Intern at Google, Assistant AI team	2022
Used Angular (TypeScript) to create reusable components for Google's issue-tracking	
Used Sass and Angular Material to build a modern, intuitive UI with support for ther	_
Completed entire development process: design doc, implementation, documentation, a	
Honors & Awards	2024
Associate Member of Sigma Xi, The Scientific Research Honor Society	2024
Featured Researcher, Oberlin Undergraduate Research office	2022
International Astronomy & Astrophysics Competition (IAAC) 2x Gold Honor for being in the top 5% of worldwide participants	2021 2022
Silver Honor for being in the top 10% of worldwide participants	2021, 2023 2020
Ambassador Award for recruiting the most students in Brazil	2020
International Youth Math Challenge (IYMC)	2020
Silver Honor for being in the top 10% of worldwide participants	2021
Bronze Honor for being in the top 20% of worldwide participants	2020
International Astronomical Search Collaboration (IASC)	_0_0
Provisional discovery of an Asteroid in data from Pan-STARRS partnered with NASA	2021
	2021
Science Outreach	
Stargazing Lecture series, Caltech	2024
Volunteer	
Screened questions for the Q&A panel at the 100th edition with Kip Thorne.	
Managed a telescope and answered audience questions at the 101st edition.	2010 2022
Astronomical Olympic League, Brazil  Content Director, Content Creator	2019 - 2022
Created free materials and events for students to prepare for Astronomy competitions	
Managed the Content Team, delegating tasks and maintaining a consistent production	
Regional Astronomical Studies Center, Brazil	2019 - 2021
Founder, Event Organizer, Lecturer	1000
Organized many public stargazing sessions, including a lunar eclipse event with over 2	ou people.
Lectured on Astronomy topics at several public schools and private events.	
Coding Projects	
Stargaging Conditions Platform	2021 Procent

## Stargazing Conditions Platform

2021 - Present

Developed app & website to see stargazing conditions.

10,000+ installs and 1,000+ active users on Google Play.

#### Telegram Bot Seller

2021

Built a Telegram bot controlled by a back-end using Node.js and MongoDB.

Won 2nd place in a Brazilian Hackathon organized by VTEX.