Dr. Ivan Almeida

ivalmeida@mpia.de | ivanalmeida.co.uk | ORCID: 0000-0001-6018-2852
Max Planck Institute for Astronomy, Heidelberg, Germany

Employment

Postdoctoral Researcher, Max Planck Institute for Astronomy
06/2025–Present
Postdoctoral Research Associate, Newcastle University
06/2023–05/2025

Education

PhD in Astrophysics, University of São Paulo
Thesis: Winds and Feedback from underfed supermassive black holes
Supervisor: Dr. Rodrigo Nemmen
04/2019–06/2023

M.Sc in Astrophysics, University of São Paulo
Dissertation: Winds and feedback from low-luminosity AGNs
Supervisor: Dr. Rodrigo Nemmen
03/2017–02/2019

B.Sc in Physics, University of São Paulo
03/2013–12/2016

Research Highlights

- ⋆ **Numerical Simulations of AGN Feedback**: Conducted detailed simulations of AGN feedback on a single galaxy, focusing on the interaction between AGN outflows and the multiphase interstellar medium (Almeida et al., in preparation a;b)
- ⋆ **Numerical Simulations of Hot Accretion Flows**: Simulated hot accretion flows around supermassive black holes, utilizing GRMHD techniques to study the dynamics near the event horizon and outflow launching (Almeida & Nemmen, 2020; Almeida, 2023 (thesis); Nemmen et al., 2024)
- ⋆ **Theoretical Modeling of Low-Luminosity AGN (LLAGN)**: Developed and applied theoretical models to explain AGN feedback in low-luminosity AGNs, focusing on their influence on host galaxy evolution (Almeida et al., 2023)
- ⋆ **Spectral Energy Density (SED) Modeling**: Modeled the spectral energy distribution of LLAGNs using a variety of methods, including RIAF+jet+wind models, to understand their multiwavelength emission (Almeida et al., 2018; De Menezes et al., 2020)
- ⋆ **Deep Learning for SED Modeling**: Co-developed a deep learning model for LLAGN multiwavelength emission, achieving computational speeds over a thousand times faster than traditional methods, improving the efficiency of data analysis (Almeida et al., 2022)
- ⋆ **Python Scripting for Data Analysis**: Created and optimized Python scripts for data analysis across all projects, ensuring reproducibility and automation in handling large datasets.
- ⋆ **High-Performance Computing (HPC) Expertise**: Extensive experience running large-scale simulations on leading supercomputers such as CSD3, COSMA, and LUMI, utilizing more than 1 million CPU hours in the last year to complete resource-intensive simulations.

Grants and Awards

- 2024: Award for Outstanding Doctoral Thesis (IAG-USP)
- 2019–2023: FAPESP Graduate Research Scholarship (PhD)
- 2017–2019: FAPESP Graduate Research Scholarship (MSc)
- 2017: IFT-UNESP/ICTP-SAIFR Prize
- 2016: FAPESP Undergraduate Research Scholarship
- 2015–2016: RUSP Undergraduate Research Scholarship

Computer Time

PI: Ivan Almeida (2025)
Probing Black Hole Accretion: Outflows and Radiative Cooling in GRMHD Simulations, DiRAC/STFC
Awarded: 3000 GPUh / 20 TB, Duration: 1 year

Co-I: Tiago Costa (2024–Now)
Simulating AGN radiation, winds and jets, DiRAC/STFC
Awarded: 20.5M CPUh / 75 TB, Duration: 3 years

Research Visits

- Institute of Astronomy, Geophysics and Atmospheric Sciences, University of São Paulo, São Paulo (Aug 2025, with Prof. R. Nemmen)
- Max Planck Institute for Astrophysics, Garching (Jul–Aug 2023, with Dr. T. Costa)
- Stanford University, Palo Alto (Feb–Mar 2023, with Prof. R. Nemmen & Prof. R. Blandford)

Teaching and Mentoring

- School Mentoring Scheme, Newcastle University (2023–2025)
- Private Tutor (2014–2018)
- Teaching Assistant, Fluid Mechanics, USP (2016)
- Teaching Assistant, Objetivo Guarulhos (2014–2016)

Outreach

- Space Investigators Exhibition, Great North Museum (2024)
- Enrichment Week, Newcastle University (2023)
- SgrA* Panel, Federal Univ. of Itajubá (2022)
- Outreach during IAU Symposium 359 (2020)

Professional Responsibilities

- Reviewer for Monthly Notices of Royal Astronomical Society (2022–Now)
- Organizer, Astro-Obs Journal Club at Newcastle University (2023–2025)
- LOC Member, Conference: “AGN Populations Across Continents and Cosmic Time”. Durham & Newcastle Upon Tyne, UK (2024)

- Organizer, Organizing the Black Hole Journal Club at University of São Paulo (2021–2023)
- LOC Member, School: "First Light: Stars, galaxies and black holes in the epoch of reionization". São Paulo, Brazil (2019)

Publications

Peer-reviewed journal articles.

1. **Almeida, I.**, Costa, T., Harrison, C., Ward, S.. Tracing AGN Feedback Power with Cool/Warm Outflow Densities: Predictions and Observational Implications. DOI: 10.1093/mnras/stag231, 2026, Monthly Notices of the Royal Astronomical Society, 546, stag231.
2. Nemmen, R. S., Vemado, A., **Almeida,I.**., Garcia, J., Motta, P. N.. Emergence of hot corona and truncated disk in simulations of accreting stellar mass black holes. DOI: 10.1093/mnras/stae1133, 2024, Monthly Notices of the Royal Astronomical Society, 492, 2553
3. **Almeida,I.**., Nemmen, R. S.. Quenching star formation with winds from low-luminosity AGN. DOI: 10.1093/mnras/stad2673, 2023, Monthly Notices of the Royal Astronomical Society, 526, 217
4. **Almeida,I.**., Duarte, R., Nemmen, R. S.. Deep learning Bayesian inference for low-luminosity active galactic nuclei spectra. DOI: 10.1093/mnras/stab3353, 2022, Monthly Notices of the Royal Astronomical Society, 509, 56
5. **Almeida,I.**., Nemmen, R. S.. Winds and feedback from supermassive black holes accreting at low rates: Hydrodynamical treatment. DOI: 10.1093/mnras/staa033, 2020, Monthly Notices of the Royal Astronomical Society, 492, 2553
6. De Menezes, R., Nemmen, R. S., Finke, J. D., **Almeida,I.**, Rani, B.. Gamma-ray observations of low-luminosity active galactic nuclei. DOI: 10.1093/mnras/staa083, 2020, Monthly Notices of the Royal Astronomical Society, 492, 4120
7. **Almeida,I.**., Nemmen, R. S., Wong, K., Wu, Q., Irwin J. A.. The multiwavelength spectrum of NGC 3115: Hot accretion flow properties. DOI: 10.1093/mnras/sty128, 2018, Monthly Notices of the Royal Astronomical Society, 475, 5398

Conference proceedings.

8. **Almeida, I.**, Costa, T., Motta, P. N., Harrison, C.. When Relativistic Jets Shape Galaxies: A Physically-Motivated Framework for AGN Feedback Across Scales. DOI: 10.22323/1.510.0044, 2026, Proceedings of High Energy Phenomena in Relativistic Outflows IX — PoS(HEPRO-IX) 044

In preparation.

9. **Almeida, I.**, Fendt, C., Vaidya, B.. Particles in Relativistic MHD Jets. III. Impact of a Multiphased Clumpy Medium onto the Jet Dynamics and Local Particle Acceleration Radiation. (*in preparation*)
10. **Almeida, I.**, Costa, T., Harrison, C., Ward, S. Comparison between wind and jet-driven outflows in clumpy media. (*in preparation*)

Full List. ADS Library: https://ui.adsabs.harvard.edu/public-libraries/o97gcPPpTfmmJUntcMLg0A

Presentations

1. Tracing AGN Feedback Power with Cool/Warm Outflows. Heidelberg, Germany. 2026.
2. When Jets Hit Clumps: Entrainment, Mixing, and Mass Loading. Würzburg, Germany. 2026.

3. When Relativistic Jets Shape Galaxies: A Physically-Motivated Framework for AGN Feedback Across Scales. Oral presentation at Extragalactic jets at all scales: A Cretan view. Heraklion, Greece. 2025.
4. Simulating AGN Across the Scales: From Accretion Discs to Galactic Feedback. Seminar at University of São Paulo. São Paulo, Brazil. 2025.
5. When Relativistic Jets Shape Galaxies: A Physically-Motivated Framework for AGN Feedback Across Scales. Oral presentation at IX HEPRO. Rio de Janeiro, Brazil. 2025.
6. Predicting Denser and Smaller Outflowing Cool Clouds for Brighter AGN. Oral presentation at DEX XXI. Newcastle Upon Tyne, United Kingdom. 2025.
7. Simulating AGN Outflows: Impact into the Galactic Cold Gas. Oral presentation at XLIX SAB. Águas de Lindoia. Brazil. 2024.
8. Simulating AGN Outflows: Impact into the Galactic Cold Gas. Oral presentation at National Astronomy Meeting. Hull. 2024.
9. Models for AGN Feedback GRMHD meets Galaxy Simulations. Oral presentation at Instituto de Astrofísica de Canarias. Tenerife. 2024.
10. Exploring Accreting Black Holes: GRMHD Simulations. Oral presentation at Meru University. Meru. 2024.
11. GRMHD Simulations Meet Galactic Evolution: A Refined Model for AGN Feedback. Oral presentation at Building Galaxies from Scratch: Advances and Challenges in Simulating Galaxy Evolution. Vienna. 2024.
12. GRMHD Simulations Meet Galactic Evolution: A Refined Model for AGN Feedback". Oral presentation at DEX XX. Durham, United Kingdom. 2024.
13. GRMHD Simulations and Galaxy Evolution". Oral presentation at Accretion Alliance. Newcastle Upon Tyne, United Kingdom. 2023.
14. Winds and feedback from supermassive black holes accreting at low rates. Oral presentation at Stanford University. Palo Alto. 2023.
15. GRMHD Simulations Meet Galactic Evolution: A Refined Model for AGN Feedback". Oral presentation at IAP colloquium: New simulations for new problems in galaxy formation. Paris. 2023.
16. Winds and feedback from supermassive black holes accreting at low rates. Oral presentation at University of Nottingham. Nottingham. 2022.
17. Deep learning Bayesian inference for low-luminosity active galactic nuclei spectra. Oral presentation in XLV SAB. São Paulo, Brazil. 2022.
18. Winds from the dark. Oral presentation in IV IAG Science Day. São Paulo, Brazil. 2019.
19. Winds and feedback from supermassive black holes accreting at low rates. Oral presentation in XLIII SAB. São Paulo, Brazil. 2018.
20. Winds and feedback from supermassive black holes accreting at low rates. Oral presentation in Galaxies in Porto Alegre workshop. Porto Alegre, Brazil. 2018.
21. Winds from the dark. Oral presentation in III IAG Science Day. São Paulo, Brazil. 2018.
22. Winds and feedback from supermassive black holes accreting at low rates. Oral presentation in II IAG Science Day. São Paulo, Brazil. 2017.
23. Measurement of Bremsstrahlung radiation in hyperpure germanium detectors. Oral presentation in XXIII SIICUSP. São Paulo, Brazil. 2015.

Posters

1. Simulating AGN Outflows: Impact into the Galactic Cold Gas. Poster session presented at Deciphering the Cosmic Code for Galaxy Formation, Puerto Varas, Chile. 2024.
2. From the horizon scales to kiloparsec: Outflows and feedback from underfed supermassive black holes. Poster session presented at Workshop: The importance of jet-induced feedback on galaxy scales, Leiden, Netherlands. 2023
3. Winds and feedback from supermassive black holes accreting at low rates. Poster session presented at GMT Community Science Meeting. Sedona, US. 2022.
4. Deep learning Bayesian inference for low-luminosity active galactic nuclei spectra. Poster session presented at EAS Annual Meeting. Valencia, Spain (online). 2022
5. Winds and Feedback from supermassive black holes. Poster session presented at GALFEED. Bento Gonçalves, Brazil. 2020.
6. Winds and Feedback from supermassive black holes. São Paulo, Brazil. 2018.
7. The multiwavelength spectrum of NGC 3115: Hot accretion flow properties. Poster session presented at 48th Saas-Fee Course: Black hole formation and growth. Saas-Fee, Switzerland. 2018.
8. The multiwavelength spectrum of NGC 3115: Hot accretion flow properties. Poster session presented at XLI SAB São Paulo, Brazil.