Miguel A. Sabogal García

Curriculum Vitæ

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Currently, I am pursuing a Master's degree in Astrophysics. My research projects are focused on Dark Energy at late and early times. Moreover, studying how DE might affect the structure formation in the universe and the tensions in cosmological parameters (H0 and S8), complemented by developing specialized software and using computational tools such as Monte Python (Monte Carlo Markov Chain code in Python), CLASS (the Cosmic Linear Anisotropy Solving System), and Gaussian processes (Machine Learning).

Research Experience, Publications, and Projects

Under Review

- Giarè, W., **Sabogal, M. A.**, Nunes, R. C., & Di Valentino, E. (2024). *Interacting Dark Energy after DESI Baryon Acoustic Oscillation measurements*. arXiv:2404.15232.

- **Sabogal, M. A**., Silva, E., Nunes, R. C., Kumar, S., Di Valentino, E., & Giarè, W. (2024). *Quantifying S8 tension and evidence for interacting dark energy from redshift-space distortion measurements*. arXiv:2408.12403

Peer-Reviewed Publications

- **Sabogal, M. A**., Akarsu, Ö., Bonilla, A., Di Valentino, E., & Nunes, R. C. (2024). *Exploring new physics in the late Universe's expansion through non-parametric inference*. **The European Physical Journal C**, 84(7), 703. DOI: 10.1140/epjc/s10052-024-13081-1 arXiv:2407.04223.

- Cardona, W., & **Sabogal, M. A.** *Holographic energy density, dark energy sound speed, and tensions in cosmological parameters: H0 and S8*. **Journal of Cosmology and Astroparticle Physics**, 2023(02), 045. DOI 10.1088/1475-7516/2023/02/045 arXiv:2210.13335.

- Oliveros, A., **Sabogal, M. A.,** & Acero, M. A. *Barrow holographic dark energy with Granda–Oliveros cutoff*. **The European Physical Journal Plus** 137, 783 (2022). DOI: 10.1140/epjp/s13360-022-02994-z**.**

- **Sabogal, M. A.**, Parra, I. C., Bandera, M., Gallardo, J., & Mejía-Cortés, C. *Mobility of localized beams in non-homogeneous photonic lattices*. **Journal of Physics: Conference Series** (2020, Vol. 1547, No. 1, p. 012023). IOP Publishing. DOI: 10.1088/1742-6596/1547/1/012023.

Science outreach publications

- **Sabogal, M. A.** *Estimación de la constante de Hubble a partir de señales de las oscilaciones acústicas bariónicas con datos simulados del LSST* (2023). **Astrobitos en español** (Spanish version of Astrobites.org) Link to the article.

Education

- 2023 - Today **Astrophysicist,** Master's degree, *Universidade Federal do Rio Grande do Sul*.

- 2023 **Perimeter-SAIFR-IFT Journeys into Theoretical Physics**, IFT/ICTP-SAIFR in São Paulo.

- 2022 **Physicist,** Bachelor's degree, *Universidad del Atlántico*.

Professional experience

05/2022 - 08/2022 **Research intern**, *Red de Estudiantes de Astronomía de Colombia, and LSST observatory.*

Tasks performed:

- *Design and development of specialized software in Python and Writing of scientific articles*
- *Statistical analysis using Markov chain Monte Carlo (MCMC)*
- *Non-parametric reconstruction using Gaussian Processes (Machine Learning)*
- *Develop the end-to-end project plans with the execution team*

Honors and Awards

- *Funding award* ***"Virtual Internship in Rubin/LSST Science to Provide Research Experience to Undergraduate Students in Colombian Institutions"****, granted by the Legacy Survey of Space and Time (****LSST****) observatory. (1/5)*
- ***Undergraduate Honors Thesis***, Universidad del Atlántico.

Volunteer experience

08/2019 - 06/2022 ***Supportive Mentor****, Physics Program, Universidad del Atlántico*

Tasks performed:

- *In-person and virtual classes of Physics and Mathematics*
- *Academic support to students in their first semesters and mid-career.*
- *Mentoring colleagues providing advice and guidance on best practices and development techniques*

Computational skills

Specialized software ***Monte Python*** *(Monte Carlo Markov Chain code in Python),* ***Cosmic Linear Anisotropy Solving System (CLASS),*** and ***Gaussian processes (GaPP)*****:** *Advanced*

Python: Advanced, **C/C++:** Intermediate, **Fortran 90:** Intermediate, **MATLAB/Mathematica/Excel**: Advanced, **HTML:** Basic

Techniques: Process Automation, Machine Learning, Statistical analysis using MCMC, Web scraping, and Object-oriented programming.

Additional languages

English (*TOEFL certified***)**	Read: **C1**	Speak: **B2**	Write: **B2**	Listen: **C1**	**Test date:** Nov 2022
Portuguese	Read: **A2**	Speak: **A2**	Write: **A1**	Listen: **A2**	

Presentations and Events

Event: *XIV Latin American Symposium on High Energy Physics*

Type of event: *International Congress*

Type of participation: *Speaker*

Conference title: *Decoding Holographic Dark Energy in the structure formation.*

Place: *QUITO, ECUADOR - Universidad San Francisco de Quito, 14/11/2022 – 18/11/2022.*

Event: *CoCo 2021: Cosmology in Colombia*

Type of event: *National Congress*

Type of participation: *Speaker*

Conference title: *Cosmological analysis of Barrow holographic dark energy model considering the Granda-Oliveros infrared cutoff.*

Place: *Online, 08/09/2021 – 11/09/2021.*

Courses and certifications

PYTHON IN ASTRONOMY Astropy Course(2022)

Work references

Mario A. Acero Ortega, Ph.D. in Physics ORCID.
Associate Professor, Physics Program, Faculty of Basic Sciences, Universidad del Atlántico.
Regular Member and Co-Founder of Colombian Network on High Energy Physics
Distinction from Neutrino Physics Center, Fermilab: Batavia, Illinois, US
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