Karolina Garcia

Astronomy PhD, CAPS Postdoctoral Fellow

Center for AstroPhysical Surveys, National Center for Supercomputing Applications,
University of Illinois Urbana-Champaign, Urbana, IL, 61801, USA

ktgarcia@illinois.edu • linkedin.com/in/karolinagarcia • karolinagarcia.github.io

Profile

Cosmologist developing mathematical tools, simulations, and using machine learning techniques to study the evolution history of the Universe.

My primary expertise lies in modeling molecular line emission in cosmological simulations, producing realistic predictions for galaxy and line-intensity mapping observations. I am specifically part of the Terahertz Intensity Mapper (TIM) collaboration.

Throughout the last few years, I have led diverse projects in large-scale structure cosmology and galaxy astrophysics: I developed a more robust method for computing the 3-point correlation function (3PCF) of galaxies, such as those observed by DESI; led tests of Euclid's galaxy cluster detection algorithms; optimized survey strategies for measuring peculiar velocity fields with Type Ia supernovae in LSST-like surveys; and helped build the detection pipeline for supernovae in the J-PAS and J-PLUS surveys.

Education

Ph.D. in Astronomy
University of Florida — Gainesville, FL, USA   2020–2024
GPA: 3.86/4.00

Master of Science in Astronomy
I. University of Florida — Gainesville, FL, USA   2018–2019
GPA: 3.86/4.00

Master of Science in Astronomy
II. Federal University of Rio de Janeiro — Brazil   2016–2018
GPA: 2.54/3.00

Bachelor of Science in Industrial Engineering (Minor in Entrepreneurship)
PUC-Rio — Brazil   2010–2014
GPA: 8.2/10

Awards and Fellowships

CAPS Postdoctoral Fellowship, NCSA, University of Illinois   2024-present

BOE Summer Fellowship, University of Florida   2018

Master's Research Fellowship (CNPQ), Federal University of Rio de Janeiro   2016-2018

Undergraduate Research Fellowship (Petrobras), PUC-Rio   2011-2012

Research and Teaching Experience

Postdoctoral Fellow, NCSA, University of Illinois   2024–present
ISM light (CO, [CII]) modeling in cosmological simulations
Cross-correlations LIM x Galaxy Surveys
TIM Analysis Pipeline

Graduate Researcher, University of Florida   2018–2024
ISM light modeling in cosmological scales using PDR + ML
Development of new 3PCF techniques for DESI
Euclid cluster detection pipeline tests + detection of Spitzer high-z clusters

Teaching Assistant, University of Florida   2021
Discover the Universe
Observational Techniques

BOE Fellow, University of Florida   2018
Completeness + purity tests on Euclid cluster finding

Graduate Researcher, UFRJ   2016–2018
LSST-like survey optimization for LSS with SNe Ia
SN detection pipeline for J-PAS/J-PLUS

Physics Teacher, INVEST Course   2015–2016
Weekly volunteer tutor for low-income university prep students

Math Tutor, Colégio PH   2011–2012

Undergrad Researcher, PUC-Rio   2011–2012
Research on nanocomposites with negative thermal expansion

Industry Experience

Finance Analyst, Shell   2015–2016
Brazil lead for Lubricants Global Key Accounts
Development of tools in VBA, reports, performance monitoring

Pricing Strategy Consultant, Hyper Consulting Company   2015
Consulting for Coca-Cola

Finance Intern, Shell   2013–2015
Automated 0.5MM commission tools, graphical reporting system

Facilities Intern, Vale S.A.   2013
Maintenance & food supply liaison for operations in Brazil

Professional Service

Newsletter and Press Release Committee, UF Astronomy Department   2021–2024

Community Involvement

UIUC Astronomy on Tap — Organizing Committee   2024–present
Ad Astra Academy (outreach and documentary project) — Team Member   2015–present
AstroTubers (Brazilian science outreach YouTube channel) — Co-founder   2017–present

Selected Publications

Karolina Garcia, Desika Narayanan, Gergö Popping, R. Anirudh, Sagan Sutherland, Melanie Kaasinen; SLICK: Modeling a Universe of Molecular Line Luminosities in Hydrodynamical Simulations; ApJ 974 197 (2024)

Karolina Garcia, Zachary Slepian; Improving the Line of Sight for the Anisotropic 3-Point Correlation Function of Galaxies: Centroid and Unit-Vector-Average Methods Scaling as $O(N^2)$; MNRAS 515 (2022) 1, 1199—1217

Karolina Garcia, Miguel Quartin, Beatriz B Siffert; On the amount of peculiar velocity field information in supernovae from LSST and beyond; Phys. of the Dark Univ. 29 (2020) 100519, 2212—6864

Wladimir Lyra, Melissa Rice, Dhyan Adler-Belendez, Neil Jacobson, Ana Pantelic, **Karolina Garcia**, L Sattler Cassara, Carolyn Crow, Paul Hayne, Jeffrey Marlow. Ad Astra Academy: Using Space Exploration to Promote Student Learning and Motivation in the City of God, Rio de Janeiro, Brazil; Communicating Astro. w/ the Public Journal 27 (2020)

Andres J Cenarro, M Moles, David Cristóbal-Hornillos [. . .] **Karolina Garcia** [. . .]. J- PLUS: The Javalambre Photometric Local Universe Survey. A&A 622 (2019) A176

Selected Talks

ALMABO24, University of Bologna	09/2024
Line Intensity Mapping 2024, UIUC	06/2024
TIM Collaboration Annual Meeting, UIUC	06/2024
CCA Cosmology Group Meeting, Flatiron Institute	12/2023
CCA Galaxy Formation Seminar, Flatiron Institute	12/2023
Galaxies and AGN Journal Club, STScI/JHU (invited)	12/2023
AIfA Seminar, University of Bonn (invited)	05/2023
ESO Lunch Talk, Munich (invited)	04/2023
Present and Future of Line-Intensity Mapping, MPA	04/2023

References

Desika Narayanan, Professor at UFlorida, desika.narayanan@ufl.edu
Joaquin Vieira, Professor at UIUC, jvieira@illinois.edu
Anthony Gonzalez, Professor at UFlorida, anthonyhg@astro.ufl.edu
Gergö Popping, Astronomer at ESO, gpopping@eso.org