

GIULIA CERINI

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Work Experience

NASA JPL Postdoctoral Scholar

Pasadena, CA (USA)

09/22/2025 - present

- Project description: Weak Gravitational Lensing and Galaxy Clustering as Probes of Dark Matter and Dark Energy
- Advisor: Jason Rhodes

NASA Postdoctoral Fellow

Pasadena, CA (USA)

09/20/2024 - 09/19/2025

- Project description: Weak Gravitational Lensing and Galaxy Clustering as Probes of Dark Matter and Dark Energy
- Advisor: Jason Rhodes

Education

University of Miami

Coral Gables, FL (USA)

Ph.D., Award of Academic Merit

2019 - 2024

- Thesis title: Baryons as tracers of dark matter in large scale structures
- Supervisor: Nico Cappelluti

University of Miami

Coral Gables, FL (USA)

M.Sc., Award of Academic Merit

2019 - 2021

Sapienza University

Rome (Italy)

M.Sc. in Astronomy and Astrophysics, Summa Cum Laude

2017 - 2019

- Thesis title: The early growth of supermassive black holes: dynamical interactions and black hole mergers in the early universe
- Supervisor: Raffaella Schneider

Sapienza University

Rome (Italy)

B.Sc. in Physics, 110/110

2005 - 2009

- Thesis title: The cosmological principle and the homogeneous isotropic metrics
- Supervisor: Paolo de Bernardis.

Research Area

My research primarily centers on the field of X-ray astrophysics and weak gravitational lensing, with a special focus on large-scale structures - particularly galaxy clusters - which I use as probes for cosmology. Currently, I am also involved in the Super-pressure Balloon-borne Imaging Telescope (SuperBIT) mission, where my work focuses on investigating the nature of dark matter through a multiwavelength analysis that combines optical observations, lensing measurements, and X-ray data to cross-correlate the distribution of galaxies, dark matter, and the intracluster medium. In past years, I also contributed to the development of models for the formation and evolution of early supermassive black holes and active galactic nuclei, with implications for future gravitational wave detectability predictions. Additionally, I worked on studies of the cosmic X-ray background, with a primary focus on tracing the warm-hot intergalactic medium (WHIM).

Research Publications and Preprints

First-Author Publications

- G. Cerini, E. Bellomi, N. Cappelluti, S. Khizroev, E. T. Lau, P. Natarajan, J. ZuHone, "Revisiting galaxy cluster scaling relations through dark matter-gas coherence: scatter dependence on dynamical state", *The Astrophysical Journal*, vol. 991, 1, p. 56, May 2025, doi: 10.3847/1538-4357/ad1f24
- G. Cerini, N. Cappelluti, M. Galeazzi, and E. Ursino, "Evidence of X-ray emission from the warm hot intergalactic medium", arXiv: 2307.14411, Mar 2023
- G. Cerini, N. Cappelluti, and P. Natarajan, "New metrics to probe the dynamical state of galaxy clusters", *The Astrophysical Journal*, vol. 945, no. 2, p. 152, Mar. 2023., doi: 10.3847/1538-4357/acbccb.

Co-Author Publications

- A. Kaminsky, N. Cappelluti, G. Hasinger, A. Peca, C. M. Casey, G. Cerini, N. E. Drakos, A. Faisst, G. Gozaliasl, O. Ilbert, J. S. Kartaltepe, A. Kashlinsky, A. M. Koekemoer, H. J. McCracken, J. Rhodes, B. E. Robertson, M. Shuntov, J. Sterling, "Tracing High-z Galaxies in X-rays with JWST and Chandra ", Apr 2025, arXiv:2502.09705v2
- A. Peca, M. J. Koss, R. Serafinelli, C. Ricci, C. M. Urry, G. Cerini, P. G. Boorman, "NuSTAR Detection of an Absorption Feature in ESP 39607: Evidence for an Ultra-fast Inflow?", May 2025. arXiv: 2505.07963v1
- R. Valiante, M. Colpi, R. Schneider, et al., "Unveiling early black hole growth with multifrequency gravitational wave observations", vol. 500, no. 3, pp. 4095–4109, Jan. 2021., doi: 10.1093/mnras/staa3395. arXiv: 2010.15096 [astro-ph.GA].

Honors, Awards, and Named Fellowships

- 2024: NASA Postdoctoral Program
- 2025: Finalist, Italian Scientists & Scholars of North America Foundation (ISSNAF) – Young Investigator INFN Bruno Touschek Award. The award recognizes outstanding contributions in the fields of fundamental interactions of matter, including elementary particle physics, nuclear physics, cosmology, and the physics of particle beams. Selected work: "Galaxy Clusters as Cosmic Colliders for Cosmology and Dark Matter".

Grants

- 2024: NASA Astrophysics Data Analysis Program (ADAP) grant (Science PI: G. Cerini), "Probing the dynamical state of galaxy clusters with NASA archival data", proposal number 23-ADAP23-0073
- 2022: NASA Chandra Cycle 24 grant (Science PI: G. Cerini), "New metrics to probe the dynamical state of galaxy clusters", proposal number 24800348.

Conference Presentations

Selected Invited Talks and Presentations

- December 2025: “Galaxy Clusters as Cosmic Colliders for Cosmology and Dark Matter”, University of Michigan, Ann Arbor, MI (USA)
- November 2025: “Galaxy Clusters as Cosmic Colliders for Cosmology and Dark Matter” - invited as finalist for the ISSNAF Young Investigator INFN Bruno Touschek Award, in recognition of my contributions in cosmology and dark matter research, Embassy of Italy, Washington DC (USA)
- October 2025: “Galaxy Clusters as Cosmic Colliders for Cosmology and Dark Matter”, Northeastern University, Boston, MA (USA)
- May 2025: “Leveraging Dark Matter–Gas Coherence for Next- Generation Galaxy Cluster Cosmology”, Center for Astrophysics | Harvard & Smithsonian, Cambridge, MA (USA)
- February 2025: “Probing the Dynamical State of Galaxy Clusters: Dark Matter-Gas Coherence and Its Implications for Scaling Relations and Cosmology”, Northeastern University, Boston, MA (USA)
- February 2024: “Novel metrics for exploring the dynamical state and evolution of galaxy clusters, and their influence on cosmology”, Florida International University, Miami, FL (USA)
- October 2023: “Revisiting galaxy cluster scaling relations through dark matter-gas coherence”, NASA Goddard Space Flight Center, Greenbelt, MD (USA)
- October 2023: “Revisiting galaxy cluster scaling relations through dark matter-gas coherence”, University of Maryland, College Park, MD (USA)
- October 2023: “Revisiting galaxy cluster scaling relations through dark matter-gas coherence”, California Institute of Technology, Pasadena, CA (USA)
- September 2023: “Revisiting galaxy cluster scaling relations through dark matter-gas coherence”, Center for Astrophysics | Harvard & Smithsonian, Cambridge, MA (USA)
- May 2023: “New metrics to probe the dynamical state of galaxy clusters”, Center for Astrophysics | Harvard & Smithsonian, Cambridge (from remote), MA (USA)
- March 2023: “New metrics to probe the dynamical state of galaxy clusters”, Massachusetts Institute of Technology, Cambridge, MA (USA)
- October 2019: “The early growth of the first early supermassive black holes”, International Workshop on Accretion History of AGN, University of Miami, Coral Gables, FL (USA).

Contributed Talks in Conferences

- October 2025: “Probing Dark Matter Physics and Cosmology through Multi-Wavelength Fourier Analysis of Galaxy Clusters”, 22nd meeting of the High Energy Astrophysics Division of the American Astronomical Society (HEAD AAS), St. Louis, MO (USA)
- March 2023: “Emission detection of the Warm Hot Intergalactic Medium”, 20th meeting of the High Energy Astrophysics Division of the American Astronomical Society (HEAD AAS), Waikoloa, HI (USA)
- January 2023: “New metrics to probe the dynamical state of galaxy clusters”, 241st meeting of the American Astronomical Society (AAS), Seattle, WA (USA).

Contributed Posters in Conferences

- June 2025: “Probing the Dynamical State of Galaxy Clusters: A Multi-Wavelength Approach with Dark Matter-Gas Coherence and Its Implications for Scaling Relations and Cosmology”, mm Universe 2025, Chicago, IL (USA)
- April 2024: “Novel metrics for exploring the dynamical state and evolution of galaxy clusters, and their influence on cosmology”, 21st meeting of the High Energy Astrophysics Division of the American Astronomical Society (HEAD AAS), Horseshoe Bay, TX (USA)
- March 2023: “New metrics to probe the dynamical state of galaxy clusters”, 20th meeting of the High Energy Astrophysics Division of the American Astronomical Society (HEAD AAS), Waikoloa, HI (USA)
- March 2022: “Power spectrum analysis of the Warm Hot Intergalactic Medium”, 19th meeting of the High Energy Astrophysics Division of the American Astronomical Society (HEAD AAS), Pittsburgh, PA (USA).

Teaching and Mentoring

- 2025-present: Co-supervisor of Ludovica Chieffo, undergraduate student at La Sapienza University of Rome, for her thesis project “Towards a Unified Multi-Wavelength Dynamical State Catalog of Galaxy Clusters.”
- 2022-2024: Supervisor of Young Scholars Program (YSP) student Sabina Khizroev, co-author of the paper “Revisiting galaxy cluster scaling relations through dark matter-gas coherence: scatter dependence on dynamical state”
- 2019-2021: Teaching assistant in undergraduate physics laboratories at the Department of Physics of the University of Miami. Topics: elementary mechanics, fluids, waves, optics, thermodynamics.

Research-Related Activities

Invited visits

- May 2025: Visiting postdoc for purposes of collaboration at the Center for Astrophysics | Harvard & Smithsonian, Cambridge, MA (USA)
- May 2025: Visiting postdoc for purposes of collaboration at the Northeastern University, Boston, MA (USA)
- March 2025: Visiting postdoc for purposes of collaboration at the Center for Astrophysics | Harvard & Smithsonian, Cambridge, MA (USA)
- February 2025: Visiting postdoc for purposes of collaboration at the Northeastern University, Boston, MA (USA)
- May 2024: Visiting student for purposes of collaboration at the Center for Astrophysics | Harvard & Smithsonian, Cambridge, MA (USA)
- January 2024: Visiting student for purposes of collaboration at the Center for Astrophysics | Harvard & Smithsonian, Cambridge, MA (USA)
- September 2023: Visiting student for purposes of collaboration at the Center for Astrophysics | Harvard & Smithsonian, Cambridge, MA (USA)

- July 2010: Invited Student at the 2nd Galileo–Xu Guangqi Meeting, Villa Hanbury, Ventimiglia (Italy), and Nice (France). The international conference focused on general relativity and cosmology.

Memberships

- 2024-present: Member of the Super-pressure Balloon-borne Imaging Telescope (SuperBIT) science team, contributing X-ray analysis expertise and supporting the investigation of dark matter through multi-wavelength cross-correlation of gravitational lensing maps, X-ray observations of intracluster gas, and optical galaxy distributions.
- Member of the American Astronomical Society (AAS) .
- 2019-2022: Member of the AGN Database (AGNDB) research group. Website: <http://agndb.physics.miami.edu>. The team worked to establish the spectro-photometric database of all the discovered active galactic nuclei (AGN). The database release is in progress and consists of more than 7 million unique AGN, with properties spanning radio to gamma wavebands across all redshifts.

Outreach

- October 2023: Invited Speaker, Career Day at Cutler Ridge Elementary School, Miami, FL (USA) — Presented my career path as a scientist to elementary school students, introducing them to astronomy and the scientific method through interactive outreach, and inspiring interest in STEM fields.
- December 2019: Invited speaker at the outreach-focused 14th Conference of Italian Researchers in the World, Miami, FL (USA). The conference was organized by the Comitato Tricolore per gli Italiani nel Mondo (CTIM) in collaboration with Miami Scientific Italian Community (MSIC), with the goal of presenting scientific research to a broad audience and fostering connections between Italian researchers and the public.
- October 2019: Contributor, Leonardo da Vinci and the Search for Knowledge event, University of Miami, Coral Gables, FL (USA) — Assisted in the organization and participated in public outreach during this interdisciplinary event, helping to explain scientific concepts to a general audience and foster engagement between the public and the scientific community.