Nicolás Garavito-Camargo – Curriculum Vitae

Flatiron Research Fellow | Center for Computational Astrophysics (CCA), NYC
E-mail: ngaravito@flatironinstitute.org | Website: jngaravitoc.github.io | Github: github.com/jngaravitoc

Research Interests: *Galactic Dynamics – Astrophysical probes of Dark Matter – Computational Methods – High-Performance Computing – N-body Simulations – Software development*

Education

Ph.D., Astronomy and Astrophysics, University of Arizona, 2021.
Advisor: Dr. Gurtina Besla
M.Sc., Physics, Universidad de Los Andes, Bogotá, Colombia, 2015.
Advisor: Dr. Jaime E. Forero-Romero
B.Sc., Physics, Universidad Nacional de Colombia, Bogotá, Colombia, 2013.
Advisor: Dr. Rigoberto A. Casas Miranda

Appointment

Flatiron Research Fellow, Flatiron Institute, October 2021-September 2024.

Scholarships and Awards

- University of Arizona, Theoretical Astrophysics Program, Graduate Student Research Prize 2021.
- University of Arizona College of Science award for Excellence in Service for graduate students, 2020. *(Awarded to one graduate student across the college of science per year.)*
- University of Arizona theory travel grant, 2016, 2018.
- McCarthy-Stoeger Scholarship 2015-2017, Vatican Observatory.

Students supervision

Total students advised or co-advised 7; 4 Ph.D, 3 undergraduates.

- Elise Darragh-Ford (Graduate student at Stanford); Fall 2023-present. I am currently advising Elise in one research project which will be the last chapter of Elise's PhD thesis and produce one paper currently under preparation.
- Silvio Varela (Graduate student at Universdad de la Serena); Fall 2022-present. I am currently co-advising Silvio in one research project which will result on a paper currently in preparation.
- Arpit Arora (Graduate student at University of Pennsylvania); Fall 2021-present. I am currently co-advising Arpit Arora in two research projects, one paper is submitted to ApJ and one is in preparation.
- Hayden Foote (Graduate student at University of Arizona); Fall 2021 - present. I co-advised Hayden in a research project that resulted in a submitted publication and one other is currently in preparation.
- Andrew Eden (Undergraduate at Florida Institute of Technology); Fall 2022-present. I am currently advising Andrew on his undergraduate thesis project which will result in a paper that is currently in preparation.
- Ludia Adhikary (Undergraduate CUNY); co-supervised with Emily Cunningham. Through the AstroCOM CUNY/CCA program; NYC Summer 2022-Summer 2023.
- Stephanie Carolina Cely Rodriguez (Undergraduate at Universidad Nacional de Colombia); co-advising undergraduate thesis; Summer 2022-Summer 2023.

Teaching Experience

Principal lecturer of 3 courses thought for a total of 12 times. Teaching assistant for 3 courses.

- Guest Lecturer for the graduate Galaxies class, Columbia University, Fall 2022.
- Teaching assistant for the Astronomy Tutoring for Majors & Minors Program. University of Arizona, Spring 2019.
- Teaching assistant for the Computational Physics class PHYS305. University of Arizona. Spring 2018.
- 3 times Lecturer of the Computational Tools at Universidad de los Andes, spring semester 2014 - spring 2015.
- 3 times Lecturer of the computational Methods Laboratory at Universidad de los Andes, semester spring 2014 - spring 2015.
- Teaching assistant of the Computational Methods Universidad de los Andes, fall semester 2014.
- Lecturer (for 3 different sessions) of the class Physics I Laboratory at Universidad de los Andes, fall semester 2013.

Academic Service

- Local and Science organizing committee of the Milky Clouds over Manhattan conference.
- PhD. thesis committee of Dr. Silvio Varela (University of La Serena, Chile), Nov-2023.
- Referee for: Astrophysical Journal (ApJ), Monthly Notices of the Royal Astronomical Society (MNRAS), Nature, Nature Astronomy, Galaxies Journal.
- Beyond-BFE collaboration coordinator: I lead the cosmological simulation group, organize in person and online meetings.
- Mentor at the City University of New York CUNY-CCA program for undergraduate students at CUNY working with mentors at the CCA, summer 2022.
- Proposal reviewer for Colombian Science Clubs, 2018.
- Local Organizing Committee of the Andean Cosmology School, Universidad de Los Andes, 2015.
- Organizer of the student astronomy seminar at the Planetarium of Bogotá, 2014-2015.

Open source and HPC experience

- Core developer and active contributor of the python packages: py-Ananke, gala, EXPtools, NBA, Cranes.
- Expertise with HPC N-body codes: Gadget-3, 4, EXP (CPU & GPU), AREPO.

Scientific Talks

47 Total: 18 Invited (denoted by †), 26 in North America, 6 in Europe, 9 in Latin America, 1 Asia.

Conferences (14)

- The Milky Way is not an island, Sexten, February, 2024.
- Surveying the Milky Way: The Universe at our backyard. Caltech, Pasadena, October, 2023.
- Friends of Friends meeting, Cordoba, Argentina, April, 2023. †
- IAU 379: Dynamical masses of local group galaxies, contributed talk, March, 2023.
- IAU 377: Early Disk-Galaxy Formation from JWST to the Milky Way, contributed talk, February, 2023.
- Colombian Congress of Astronomy, Plenary talk, August, 2022. †
- Friends of friends meeting, Cordoba, Argentina, April, 2022.

- Division on Dynamics Astronomy, Virtual meeting, May 2021.
- Streams 21, Virtual Conference, February 2021.
- The Local Group: Assembly and Evolution, virtual conference, August 2020.
- European Astronomical Society meeting, virtual meeting, June 2020.
- Durham University, UK, Small Galaxies Cosmic Questions, August, 2019.
- MPIA, Heidelberg, Stellar halos across the cosmos, July 2018.
- LARIM, Cartagena, Colombia, October 2016.
- EWASS, Geneve, Switzerland, July 2014.

Seminars and Colloquia (33)

- UC Riverside, seminar, October 2023. †
- Universidad de La Serena, La Serena, Chile, May 2023. †
- Instituto de Astronomía y Física del Espacio (IAFE), Buenos Aires, April, 2023.
- Max Planck Institute for Astrophysics, Cosmology Seminar, March, 2023.
- U. Rutgers, Astronomy Seminar, Nov, 2022. †
- U. Columbia, Lunch talk, Sept, 2022. †
- STScI, galaxies lunch talk, May, 2022. †
- Universidad de Antíoquia, seminar, February, 2022. †
- University of Massachusetts, Amherst, Colloquium, Jan, 2022. †
- University of Madison-Wisconsin, Science seminar, November 2021.†
- University of Michigan, Galaxies group seminar, November 2021.†
- NYU, CCPP, seminar, November 2021.†
- CCA, Flatiron Institute, Lunch Talk, October, 2021.
- Steward Observatory, Theoretical Astrophysics Program (TAP) colloquium, September, 2021.†
- ComSciCon, June 2021. †.
- Steward Observatory, Galaxy lunch talk, March, 2021.
- Univesidad de los Andes, Astronomy Seminar, February, 2021.
- UC Irvine, Astronomy Seminar, January, 2021. †
- Steward Observatory, Early Career Scientist talk, December, 2020. †
- CCAPP, Seminar, December, 2020. †
- Princeton, Journal Club, November 2020. †
- KIPAC, Stanford, Tea-Talk, October 2020.
- Harvard Center for Astrophysics, GCSP seminar, October 2020.
- Carnegie Observatories, seminar, October 2020. †
- University of California Berkeley, lunch talk, September 2020.
- The Royal Observatory of Edinburgh, UK, Coffee Talk, August 2019. †
- W.M. Keck Observatory, Journal Club, June 2019.
- Magellanic Cloud Fest III, University of Arizona, May, 2019.
- JILA Seminar, JILA Institute, University of Colorado, December 2017.
- STScI Galaxies Journal Club. December 2016.
- Magellanic Cloud Fest II, University of Arizona, March 2016.

- UNAM, Mexico City, Mexico, Nov 2013.
- Centro de Investigaciones De Astronomía CIDA, Merida, Venezuela, July 2013.

†*Invited*

Posters

- European Astronomical Society meeting, virtual meeting, June 2020.
- Rediscovering our Galaxy, IAU symposium 334, Potsdam, Germany. July 2017.

Telescope and HPC time Awarded

- Hubble Space Telescope, 32 orbits, Cycle 31, 2023. PI: Prof. Sukanya Chakrabarti (U. Alabama).
- MareNostrum Super computer, 1.7 million CPU hours, AECT-2023-2-0016, 2023. PI: Prof. Chervin Laporte (U Barcelona).
- GMRT 60 hours cycle 44, 2023. PI: Prof. Karin Menendez-Delmestre (Valongo Observatory, Rio de Janeiro).
- Blanco Telescope, "*A VISTA-DECam Experiment in Near-Field Cosmology: Search for the Magellanic Dark Matter Wake*" cycle 2020B. PI: Prof. Julio Chaname (Universidad Catolica de Chile), 3 nights.

Grants

- LSSTC Grant Award (Virtual Internship in Rubin/LSST Science to Provide Research Experience to Undergraduate Students in Colombian Institutions) 2021-51, 2021. CO-PI: Nicolás Garavito-Camargo. This grant was awarded to support undergraduate research summer projects.
- International Astronomical Union (IAU) Office of Astronomy development (OAD) grant 2021. PI: Nicolás Garavito-Camargo. This grant was awarded to support the mentorship program for undergraduate students in Colombia.
- University of Arizona theory travel grant, 2016 and 2018.
- IAU travel grant, 2016.

Observing Experience

- DECam, Blanco-4m telescope, CTIO, Chile, 3 nights, 2020.
- VATT telescope. Mt Graham, Arizona, 4 nights, 2016.
- CIDA, Merida, Venezuela - 2 nights, 2013.

Diversity, Equity, Inclusion (DEI) and outreach:

DEI Leadership:

- Co-creator of the 10-week RECA internship program for astronomy students in Colombia. May-August 2021.
- Co-creator of the RECA mentorship program for astronomy students in Colombia. 2020-present. (The mentorship program pairs up students with professional astronomers to provide guidance through the application process to graduate programs)
- Co-organizer, Diversity Journal Club Steward Observatory, 2018-2021.
- Creator, Astrocharlas, Steward Observatory, 2018-present. (Spanish outreach series talks in astronomy)
- Writer for Astrobitos, 2018-present.
- Mentor, Tucson Initiative for Minority Engagement in Science and Technology Program TIMESTEP, 2016-2018.

Outreach

- Classroom astronomer, NOAO Project ASTRO, 2018-2019.
- Discussion leader, NOAO Teen Astronomy Cafe, 2018.
- Planetarium SpaceArt mentor for Children, Bogotá, Colombia, 2013-2014.

Research highlights in the news

- Sky & Telescope: How our largest dwarf galaxy keeps other in line
- JPL Nasa: Astronomers Release New All-Sky Map of Milky Way's Outer Reaches
- Syfy Wire: Dark Matter could be powering a galaxy that orbits the Milky Way until they collide
- Astrobites:
- Phys.org: Astronomers release new all-sky map of the Milky Way's outer reaches
- University of Arizona news: Astrophysicist help chart dark matters invisible ocean
- AAS NOVA 2020: An Asymmetric Dark Matter Halo
- AAS NOVA 2019: Hunting for a Dark Matter Wake

Publications list

ORCID, ADS, arXiv
refereed: 23 – first author: 5 – Student lead: 1 (denoted by †) – $h-$index: 11 – citations : 871 (as of Feb 26th/2023)

23. *Generating synthetic star catalogs from simulated data1 for next-gen observatories with py-ananke*
Adrien C. R. Thob, Robyn E. Sanderson, Andrew P. Eden, Farnik Nikakhtar, Nondh Panithanpaisal, **Nicolás Garavito-Camargo**, and Sanjib Sharma (Submitted to JOSS 2023).

22. *Dark matter distribution in Milky Way-analog galaxies*
Natanael Gomes-Oliveira, K. Menéndez-Delmestre, T. S. Gonçalves, D. C. Rodrigues, M. Grossi, **N. Garavito-Camargo**, A. Araújo, P. P. B. Beaklini, Y. Cavalcante-Coelho, A. Cortesi, L. H. Quiroga-Nuñez, T. Randriamampandry (ApJ submitted 2023).

21. *LMC-driven anisotropic boosts in stream–subhalo interactions* †
Arora, A., **Garavito-Camargo, N.**, Sanderson, R. E., Cunningham, E. C., Wetzel, A., Panithanpaisal, N., Barry, M. (ApJ submitted 2023).

20. *The proto-galaxy of Milky Way-mass haloes in the FIRE simulation*
Horta, Danny; Cunningham, Emily C.; Sanderson, Robyn; Johnston, Kathryn V.; Deason, Alis; Wetzel, Andrew; McCluskey, Fiona; **Garavito-Camargo, Nicolás**; Necib, Lina; Faucher-Giguère, Claude-André ; Arora, Arpit ; Gandhi, Pratik J. (ApJ Submitted 2023)

19. *Galactoseismology in cosmological simulations: Vertical perturbations by dark matter, satellite galaxies and gas.* Garcia-Conde. B, Antoja. T, Roca-Fabrega. S, Gómez. G, Ramos. P,. **Garavito-Camargo. N**, Gómez-Flechoso, MA. (accepted for publication in MNRAS 2023)

18. *On the co-rotation of Milky Way satellites: LMC-mass satellites induce apparent motions in outer halo tracers*
Nicolás Garavito-Camargo, Adrian M. Price-Whelan , Emily C. Cunningham, Jenna Samuel, Ekta Patel, Andrew Wetzel, Kathryn V. Johnston, Arpit Arora, Robyn E. Sanderson, Lehman Garrison, and Danny Horta (submitted 2023)

17. *Structure, Kinematics, and Observability of the Large Magellanic Cloud's Dynamical Friction Wake in Cold vs. Fuzzy Dark Matter*
Hayden R. Foote, Gurtina Besla, Philip Mocz, **Nicolás Garavito-Camargo**, Lachlan Lancaster, Martin Sparre, Emily C. Cunningham, Mark Vogelsberger, Facundo A. Gómez , and Chervin F. P. Laporte, ApJ submitted 2023

16. *The impact of the Large Magellanic Cloud on dark matter direct detection signals*
Smith-Orlik, Adam ; Ronaghi, Nima ; Bozorgnia, Nassim ; Cautun, Marius ; Fattahi, Azadeh ; Besla, Gurtina ; Frenk, Carlos S. ; **Garavito-Camargo, Nicolás** ; Gómez, Facundo A. ; Grand, Robert J. J. ; Marinacci, Federico ; Peter, Annika H. G. JCAP submitted 2023

15. *Lopsided Galaxies in a cosmological context: a new galaxy-halo connection*
Silvio Varela-Lavin, Facundo A. Gómez, Patricia B. Tissera, Gurtina Besla, **Nicolás, Garavito-Camargo**, Federico Marinacci. Submitted to MNRAS 2022.

14. *On the stability of tidal streams in action space*
Arpit Arora, Robyn E. Sanderson, Nondh Panithanpaisal, Emily C. Cunningham, Andrew Wetzel, **Nicolás Garavito-Camargo**. ApJ l, vol. 939, no. 1, (2022).

13. *Implications of the Milky Way travel velocity for dynamical mass estimates of the Local Group*
Katie Chamberlain, Adrian M. Price-Whelan, Gurtina Besla, Emily C. Cunningham, **Nicolás Garavito-Camargo**, Jorge Peñarrubia, Michael S. Petersen. ApJ (2022)

12. *The Clustering of Orbital Poles Induced by the LMC: Hints for the Origin of Planes of Satellites*
Garavito-Camargo, Nicolás; Patel, Ekta; Besla, Gurtina; Price-Whelan, Adrian; Laporte, Chervin; Gómez, Facundo A; Kathryn V. Johnston; ApJ in press (2021).

11. *Detection of the All-Sky Response of the Galactic Halo to the Magellanic Clouds*
Conroy, Charlie; Naidu, Rohan P; **Garavito-Camargo; Nicolás**; Besla, Gurtina; et al. Nature (2021).

10. *Quantifying the impact of the Large Magellanic Cloud on the structure of the Milky Way's dark matter halo using Basis Function Expansions*
Garavito-Camargo, Nicolás; Besla, Gurtina; Laporte, Chervin; Price-Whelan, Adrian M.; et al. ApJ, 919, 109, (2021).

9. *Quantifying the Stellar Halo's Response to the LMC's Infall with Spherical Harmonics.*
Cunningham, Emily C; **Garavito-Camargo, Nicolas**, Deason, Alis J; Johnston, Kathryn V. et al. ApJ, 898, 1,(2020).

8. *The orbital histories of Magellanic Satellites Using Gaia DR2 proper motions.*
Patel, Ekta; Kallivayalil, Nitya; **Garavito-Camargo, Nicolas** et. al., ApJ 893, 121, (2020).

7. *The highest-speed local dark matter particles come from the Large Magellanic Cloud.*
Besla, Gurtina; Peter, Annika; **Garavito-Camargo, Nicolas**. JCAP, 11, 13, (2019).

6. *Hunting for the DM Wake induced by the LMC.*
Garavito-Camargo, Nicolas; Besla, Gurtina; Laporte, Chervin F.P; Johnston, Kathryn V; Gómez, Facundo A; Watkins, Laura. ApJ Accepted, (2019).

5. *The influence of Sagittarius and the Large Magellanic Cloud on the stellar disc of the Milky Way Galaxy.*
Laporte, Chervin F. P; Johnston, Kathryn V; Gómez, Facundo A; **Garavito-Camargo, Nicolas**; Besla, Gurtina. MNRAS, 481, 286L, (2018).

4. *The Extremely Luminous Quasar Survey in the Sloan Digital Sky Survey Footprint. II. The North Galactic Cap Sample.*
Schindler, Jan-Torge; Fan, Xiaohui; McGreer, Ian D; Yang, Jinyi; Wang, Feige; Green, Richard; **Garavito-Camargo, Nicolas** et al., ApJ, 863, 144S, (2018).

3. *Modelling the gas kinematics of an atypical Lyα emitting compact dwarf galaxy.*
Forero-Romero, Jaime E., Gronke, Max., Remolina-Gutiérrez, Maria Camila, **Garavito-Camargo, Nicolas**, Dijkstra M. MNRAS, 474, 12F, (2018).

2. *Response of the Milky Way's disc to the Large Magellanic Cloud in a first infall scenario.*
Laporte, C.; Gomez, F; Besla, Gurtina; Johnston, Kathryn V; & **Garavito-Camargo, Nicolas**. MNRAS, 473, 1218L, (2018).

1. *The impact of gas bulk rotation on the morphology of the Lyman-alpha line.*
Garavito-Camargo, J.N; Forero-Romero J.E; Dijkstra M. ApJ, 795, 120, (2014).

White papers

3. *NANCY: Next-generation All-sky Near-infrared Community surveY* Jiwon Jesse Han, et al. (incl. **Garavito-Camargo, N**).call for white papers for the Roman Core Community Survey

2. *Mass Spectroscopy of the Milky Way*
Dey, Arjun. et al., (incl. **Garavito-Camargo, N**). Astro2020: Decadal Survey on Astronomy and Astrophysics, Vol. 51, Issue 3, id. 489 (2019).

1. *The Multidimensional Milky Way.*
Sanderson, Robyn E .et al. (incl. **Garavito-Camargo**) 2019. Astro2020: Decadal Survey on Astronomy and Astrophysics, 2019, Vol. 51, Issue 3, id. 347 (2019).