Joaquín Armijo

Machine learning for science and technology

Career Objectives

Exploring machine learning applications to deepen our understanding of our world by applying cutting-edge techniques from theoretical frameworks and simulations to observational data. I am committed to create sophisticated numerical methods for modeling complex physical phenomena, always driven by a passion for understanding the cosmos.

Personal Information

Nationality	Chilean
Date of Birth	17th October, 1993
Languages	Spanish (native), Portuguese (fluent), English (fluent), Japanese (Beginner)

Skills

Programming: Python (NumPy, SciPy, pandas, Matplotlib), C, C++, PyTorch, JAX, CUDA, MPI, OpenMP.
Advanced Statistics: Simulation-based inference, Bayesian inference, higher-order statistics, emulators.
Numerical Simulations: N-body and modified gravity simulations, halo finders, HPC environments, GPU simulations.
Software Tools: Git, Linux/Unix, Jupyter, LaTeX, Docker.
Communication: Teaching and mentoring, outreach talks for large audiences, workshop organization, podcasting.
Hobbies: Sports, storytelling, guitar.

Software

DeepLensingFlow: https://github.com/jarmijotorres/DeepLensingFlow (Author)
Application of Normalizing flow and Diffusion model for weak lensing statistics (open sourced).
HOScodes: https://github.com/LSSTDESC/HOS-Y1-prep/tree/master/hoscodes. Pipeline for LSST-DESC Higher-order statistics topical team. Application of several statistics for the Year-1 Rubin data. (Property of LSST-DESC)

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Education

2018-2022 **Dphil**, *Institute of Computational Cosmology, Durham University*, Durham, United Kingdom, Thesis: *A* framework to test modified gravity using galaxy surveys.

2016 - 2018 **Master in science**, *Institute of Astrophysics, Pontificia Universidad Católica de Chile*, Santiago, Chile., Thesis: *T*esting modified gravity using a marked correlation function..

2012 - 2016 **Degree in Astronomy**, *Pontificia Universidad Católica de Chile*, Santiago, Chile.

Appointments

Postdoctoral fellowship.

Fellow at The Institute of Physics, The University of São Paulo

October 2025 - Present.

Postdoctoral fellowship.

Project researcher at The Kavli Institute for the Physics and Mathematics of the Universe, The University of Tokyo

October 2022 - September 2025.

PhD student at the Institute for Computational Cosmology

Supervisors Prof. Carlton Baugh (c.m.baugh@durham.ac.uk), Prof. Peder Norberg

October 2018 - September, 2022.

Internship at Tharsus Company.

Sponsored by the Centre of Doctoral Training at Durham Univesrity, Tharsus.

Supervisors Dr. Paul Featonby

May - July, 2020.

Visitor astronomer

European Southern Observatory (ESO) winter internship, Santiago Chile.

Supervisor Prof. Manuela Zoccali and Dr. Luca Sbordone

August, 2014.

Selected Publication list

(308 citations; h-index: 8)

Under preparation / in review:

- **Armijo, J.**, Thiele, L., Liu, J., "Weak lensing statistic covariance replication with flow based models". *to be submitted to PRD.*

- **Armijo, J.**, Da Costa, L., "Marked statistics across the cosmic web: Environmental dependent clustering in modified gravity simulations". *to be submitted to MNRAS.*

- Tokiwa, A. Bayer, A. E., **Armijo, J**, Liu, J., et al., "Impact of Simulation Box Size for Weak Lensing: Replication and Super-Sample Effects". *to be submitted to JCAP.*

Peer-reviewed publications:

- Cowell, J. A. **Armijo, J.**, Thiele, L., Marques, G. A., et al., "First Constraints from Marked Angular Power Spectra with Subaru Hyper Suprime-Cam Survey First-Year Data " eprint arXiv:2507.12315 (2025).
- **Armijo, J.**, Marques, G. A., Novaes, C. P., Thiele, et al., "Cosmological constraints using Minkowski functionals from the first year data of the Hyper Suprime-Cam",Monthly MNRAS (2025).
- Novaes, C. P., Thiele, L., **Armijo, J.**, et al., "Cosmology from HSC Y1 Weak Lensing with Combined Higher-Order Statistics and Simulation-based Inference", PRD (2024).
- **Armijo, J.**, Baugh, C. M., Norberg, P., & Padilla, N. D., "A new test of gravity - I. Introduction to the method", MNRAS (2024).
- **Armijo, J.**, Baugh, C. M., Norberg, P., & Padilla, N. D., "A new test of gravity - II. Application of marked correlation functions to luminous red galaxy samples", MNRAS (2023).
- **Armijo, J.**, Baugh, C. M., Padilla, N. D., Norberg, P., & Arnold, C., "Making use of sub-resolution haloes in N-body simulations", MNRAS (2022).

- **Armijo, J.**, Cai, Y.-C., Padilla, N., Li, B., & Peacock, J. A., "Testing modified gravity using a marked correlation function", MNRAS (2018).

Workshops and Seminars

Invited talks:

2022 **IfA Seminar at University of Edinburgh. September.** Edinburgh. United Kingdom.

2023 **Seminar at UTFSM. March.** Santiago. Chile.

2024 **Seminar at PUCV. April.** Valparaiso. Chile.

2024 **Observatorio Calán at U. de Chile seminar. April.** Santiago. Chile.

2024 **Mock Barcelona at UAB. October.** Barcelona. Spain.

2025 **LeCosPA meets IPMU. March.** Taipei. Taiwan.

2025 **Friday Seminar at ICC, Durham University.** Durham. UK.

2025 **Workshop on Large-scale Structure Oxford-IPMU at Oxford University.** Oxford. UK.

2025 **Mock NYC.** New York City. USA.

Grants & Awards

LACEGAL Project internship.

July - August 2017. Pontificia Universidad Católica de Chile. Santiago, Chile

Programa Formación de Capital Humano Avanzado, becas-Chile 2019. Consejo Nacional de Ciencia Y Tecnología.

October 2018 - September 2022. Durham University, United Kingdom.

LACEGAL Project internship.

November - December 2019. Institute for Computational Cosmology, Durham University. Durham, United Kingdom.

Kavli IPMU postdoctoral fellowship.

October 2022 - September 2025. Kavli Institute for the Physics and Mathematics of the Universe, The University of Tokyo. Tokyo, Japan.

Grants-in-Aid for Scientific Research KAKENHI grant.

March 2023 - February 2025. The Japan Society for the Promotion of Science (JSPS).

FAPESP fellowship

October 2025 - September 2027. Fundação de Amparo à Pesquisa do Estado de São Paulo (FAPESP).

Leadership

2022 CDT Durham virtual summer school. SOC/LOC.

2023 Astro Journal club organizing. Kavli IPMU.

2024 CD3 group meetings and hack fridays. Kavli IPMU.

2024 CD3×CCA joint workshop. Kavli IPMU. SOC hackton organizer.

2024 Baryons in the Universe April. Kavli IPMU. LOC.

2025 Beyond two-point statistics meets survey systematic workshop, September. Kavli IPMU. LOC.

Mentoring

2025 Lucas Da Costa. ILANCE. Project: The environmental dependent clustering in modified gravity simulations.

2024 Valentin Clarisse. ILANCE. Project: The information inside marked correlation function and power spectrum in the Quijote-MG simulations.

2024 Akira Tokiwa. Kavli IPMU. Project: Super sample covariance in weak lensing higher-order statistics.

2024 Jess Cowell. Kavli IPMU. Project: First application of the marked power spectrum on the HSC-Y1 data.

Teaching Training

Lectures

2025 Cosmology and large-scale structure crash course for ILANCE students. Organizer, Elisa Ferreira.

Teacher's assistant

2025 Handling Large-scale structure numerical simulations in python. Crash course for master and PhD students.

2021-2022 Python programming introduction for PhD students. Durham University

Teacher's assistant

2016-2017 Space-time and Universe. Professor: Dr. Rolando Dünner. Pontificia Universidad católica de Chile

2015 Classical Physics. Professor: Dr. José Mejía. Pontificia Universidad Católica de Chile

2012-2017 Classical Mechanics. Facultad de Física. Pontificia Universidad Católica de Chile.

References

Prof. Carlton Baugh
Director of research
Institute of Computational Cosmology
Durham University
✉ c.m.baugh@durham.ac.uk

Prof. Nelson Padilla
Director
Instituto de Astronomía Téorica y Experimental
Argentine National Observatory
✉ n.d.padilla@gmail.com

Prof. Jia Liu
Director
Centre for Data-Driven Discovery
Kavli Institute for physics and mathematics of the Universe, The University of Tokyo
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