

# Arthur Loureiro

RESEARCHER · ASTROPHYSICS & COSMOLOGY

The Oskar Klein Centre for Cosmoparticle Physics, Department of Physics, Stockholm University, Stockholm SE-106 91, Sweden

Visitor at Imperial Centre for Cosmology and Inference, Imperial College London, Physics Department, London, UK

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## Research & Work Experience

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### Stockholm University

RESEARCHER

Researcher working with Prof. Jens Jasche, Prof. Hiranya Peiris, and LSST DESC software in-kind contributions.

Stockholm, Sweden

March. 2023 - Ongoing

### Imperial College London

POST-DOCTORAL RESEARCH ASSOCIATE (CURRENTLY VISITING RESEARCHER)

London, United Kingdom

PDRA (2019-2020) and visiting researcher (currently) working with Profs. Heavens & Jaffe on Field Level Inference for Cosmic Shear on the sphere.

Dec. 2019 - PRESENT

### University of Edinburgh

SENIOR SCIENTIST/DEVELOPER (50% FTE UNTIL OCT. 2022)

Edinburgh, United Kingdom

Sept. 2021 - Feb. 2023

Euclid SGS Senior Scientist/Developer working with Prof. Andy Taylor on weak lensing shape measurement calibration and sensitivity.

### University College London

RESEARCH FELLOW (50% FTE FROM SEPT. 2021)

London, United Kingdom

UCL Research Fellow working with Prof. Benjamin Joachimi on Bayesian methods for cosmological galaxy surveys such as the Euclid Satellite.

Apr. 2020 - Sept. 2022

### University College London

POST-DOCTORAL RESEARCH ASSISTANT

London, United Kingdom

Euclid SGS PDRA working with Prof. Benjamin Joachimi on pipeline development, testing, and validation for Weak Lensing power spectra.

Dec. 2018 - Dec. 2019

## Education

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### University College London

PHD IN ASTROPHYSICS

London, United Kingdom

2015 - 2019

Advisors: Dr. Filipe Abdalla and Prof. Ofer Lahav

Thesis: The Universe in Harmonic Space: Neutrinos and Dark Energy

### University of São Paulo

MASTERS IN MATHEMATICAL PHYSICS

São Paulo, Brazil

2013 - 2015

Advisor: Prof. L. Raul Abramo

Thesis: Galaxy Power Spectrum: A Monte-Carlo Approach

### Université de Montréal

UNDERGRADUATE EXCHANGE

Montréal, Canada

2012

Exchange program as a bachelor student in Physics under the Science without Borders Scholarship.

### Universidade Federal do Rio Grande do Sul

UNDERGRADUATE DEGREE IN PHYSICS WITH EMPHASIS IN ASTROPHYSICS

Porto Alegre, Brazil

2010 - 2013

Advisor: Prof. Silvio R. Dahmen

Dissertation: Relativistic Thermodynamics applied to Cosmological Models

## Grants & Awards

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### UNIVERSITY COLLEGE LONDON (UNITED KINGDOM)

2020-2022 **UCL Provost Strategic Fund Fellowship**, University College London

£112 554

### NATIONAL COUNCIL FOR SCIENTIFIC AND TECHNOLOGICAL DEVELOPMENT (BRAZIL)

2015-2018 **Science without Borders PhD Fellowship**, University College London

£131 378

2013-2015 **CNPq Masters Scholarship**, University of São Paulo

R\$30 000

2012 **Science without Borders Exchange Scholarship**, Université de Montréal

CAN\$6700

# Skills & Professional Services

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<b>Programming</b>	Advanced Python, Jupyter Notebook, Bash, and Slurm for HPC; intermediate C/C++, Julia, SQL.
<b>Cosmological Codes</b>	CLASS, Hi-CLASS, CAMB, Monte Python, Flask, CCL, Healpix, and Glass (co-developer)
<b>Peer Reviewer</b>	Journal of Cosmology and Astroparticle Physics, Monthly Notices of the Royal Astronomical Society, The Open Journal of Astrophysics
<b>Scientific Collaborations</b>	LSST Dark Energy Science Collaboration, Euclid Consortium, Kilo Degree Survey, Aquila Consortium
<b>Leadership Roles</b>	PDRA Representative at UCL's Astro Group (2020-2022), Co-Lead Euclid LE3 Weak Lensing Pre-Launch Key Project (2021-2022)
<b>Languages</b>	<b>English:</b> Fluent (speaking, reading, writing); <b>Portuguese:</b> Native; <b>French:</b> Intermediate (speaking, reading) and basic (writing); <b>Spanish:</b> Basic (writing, speaking, reading);

## Publications

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An up-to-date list of publications and citations can be found in [ADS here](#).

\* Identify publications for which I am a corresponding author but not the first author.

1. [\*Almanac: MCMC-based signal extraction of power spectra and maps on the sphere\*](#)  
E. Sellentin, **A. Loureiro\***, L. Whiteway et al. *The Open Journal of Astrop.*, 6, 31, 2023
2. [\*GLASS: Generator for Large Scale Structure\*](#)  
N. Tessore, **A. Loureiro\***, B. Joachimi et al., *The Open Journal of Astrop.*, 6, 11, 2023
3. [\*Almanac: Weak Lensing power spectra and map inference on the masked sphere\*](#)  
**A. Loureiro**, L. Whiteway, E. Sellentin, J. S. Lafaurie, A. H. Jaffe, A. F. Heavens, *The Open Journal of Astrop.*, 6, 6, 2023
4. [\*Euclid Preparation. TBD. Impact of magnification on spectroscopic galaxy clustering\*](#)  
Euclid Collab., G. Jelic-Cizmek et al. (incl. **A. Loureiro**), ArXiv:2311.03168, Submitted to *A&A*, 2023
5. [\*Euclid preparation. TBD. The effect of baryons on the Halo Mass Function\*](#)  
Euclid Collab., T. Castro et al. (incl. **A. Loureiro**), ArXiv:2311.01465, Submitted to *A&A*, 2023
6. [\*Euclid preparation. TBD. Forecast impact of super-sample covariance on 3x2pt analysis with Euclid\*](#)  
Euclid Collab., D. Sciotti et al. (incl. **A. Loureiro**), ArXiv:2310.15731, Submitted to *A&A*, 2023
7. [\*Euclid preparation. TBD. The effect of linear redshift-space distortions in photometric galaxy clustering and its cross-correlation with cosmic shear\*](#)  
Euclid Collab., K. Tanidis et al. (incl. **A. Loureiro**), ArXiv:2309.00052, Submitted to *A&A*, 2023
8. [\*Euclid Preparation. TBD. Characterization of convolutional neural networks for the identification of galaxy-galaxy strong lensing events\*](#)  
Euclid Collab., L. Leuzzi et al. (incl. **A. Loureiro**), ArXiv:2307.08736, Submitted to *A&A*, 2023
9. [\*Euclid preparation. XXIX. Water ice in spacecraft Part I: The physics of ice formation and contamination\*](#)  
Euclid Collab., M. Schirmer et al. (incl. **A. Loureiro**), *A&A*, 675, 2023
10. [\*Euclid preparation. XXXI. The effect of the variations in photometric passbands on photometric-redshift accuracy\*](#)  
Euclid Collab., S. Paltani et al. (incl. **A. Loureiro**), ArXiv:2310.14716, Submitted to *A&A*, 2023
11. [\*Euclid preparation. XXX. Performance assessment of the NISP Red-Grism through spectroscopic simulations for the Wide and Deep surveys\*](#)  
Euclid Collab., L. Gabarra et al. (incl. **A. Loureiro**), *A&A*, 676, 2023
12. [\*Euclid preparation. XXVII. A UV-NIR spectral atlas of compact planetary nebulae for wavelength calibration\*](#)  
Euclid Collab., K. Paterson et al. (incl. **A. Loureiro**), *A&A*, 674, 2023
13. [\*Euclid preparation: XXVIII. Modelling of the weak lensing angular power spectrum\*](#)  
Euclid Collab., A. C. Deshpande et al. (incl. **A. Loureiro**), ArXiv:2302.04507, Submitted to *A&A*, 2023
14. [\*Euclid preparation. XXXII. Evaluating the weak lensing cluster mass biases using the Three Hundred Project hydrodynamical simulations\*](#)  
Euclid Collab., C. Giocoli et al. (incl. **A. Loureiro**), ArXiv:2302.00687, Submitted to *A&A*, 2023
15. [\*Euclid Preparation XXVIII: Forecasts for 10 different higher-order weak lensing statistics\*](#)  
Euclid Collab., V. Ajani et al. (incl. **A. Loureiro**), *A&A*, 675, 2023
16. [\*Euclid preparation: XXIII. Derivation of galaxy physical properties with deep learning using mock fluxes and H-band images\*](#)  
Euclid Collab., L. Bisigello et al. (incl. **A. Loureiro**), *MNRAS*, 520, 2023
17. [\*Euclid preparation. XXV. The Euclid Morphology Challenge – Towards model-fitting photometry for billions of galaxies\*](#)  
Euclid Collab., E. Merlin et al. (incl. **A. Loureiro**), *A&A*, 671, 2023
18. [\*Euclid preparation XXVI: The Euclid Morphology Challenge. Towards structural parameters for billions of galaxies\*](#)  
Euclid Collab., H. Bretonnière et al. (incl. **A. Loureiro**), *A&A*, 671, 2023
19. [\*Euclid preparation. XXIV. Calibration of the halo mass function in  \$\Lambda\(\nu\)\$ CDM cosmologies\*](#)  
Euclid Collab., T. Castro et al. (incl. **A. Loureiro**), *A&A*, 671, 2023

20. *Fisher matrix for the angular power spectrum of multi-tracer galaxy surveys*  
L. R. Abramo, J. V. D. Ferri, I. L. Tashiro & **A. Loureiro**, *JCAP*, 08, 2022
21. *KiDS & Euclid: Cosmological implications of a pseudo- $C_\ell$  analysis of KiDS-1000 cosmic shear tomography*  
**A. Loureiro**, L. Whittaker, A. Spurio Mancini, KiDS Collaboration & Euclid Collab., *A & A*, 665, 2022
22. *Euclid preparation. XVII. Covariance model validation for the 2-point correlation function of galaxy clusters*  
Euclid Collab., A. Fumagalli et al. (incl. **A. Loureiro**), ArXiv:2211.12965, Submitted to *A&A*, 2022
23. *Euclid: Covariance of weak lensing pseudo- $C_\ell$  estimates. Calculation, comparison to simulations, and dependence on survey geometry*  
R. Upham et al. (incl. **A. Loureiro**), *A & A*, 660, 2022
24. *Euclid preparation: XX. The Complete Calibration of the Color-Redshift Relation survey: LBT observations and data release*  
Euclid Collab., R. Saglia et al. (incl. **A. Loureiro**), *A & A*, 664, 2022
25. *Upper Bound of Neutrino Masses from Combined Cosmological Observations and Particle Physics Experiments*  
**A. Loureiro**, A. Cuceu, et al., *Physical Review Letters*, 123, 2019
26. *Cosmological measurements from angular power spectra analysis of BOSS DR12 tomography*  
**A. Loureiro**, B. Moraes, et al., *MNRAS*, 485, 2019
27. *Fourier analysis of multitracer cosmological surveys*  
L. R. Abramo, L. F. Secco & **A. Loureiro**, *MNRAS*, 455, 2016

## Research Supervision

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2023	<b>Ivan Sladoljev (MSc Erasmus)</b> , Supervisor for Erasmus Exchange Research Trainee from U. of Zagreb on a project “Field Level Inference for PNGs in the CMB”	Stockholm University
2020 - 2021	<b>Lisa Goh (MSc)</b> , Co-supervisor together with Dr Lee Whittaker and Dr Benjamin Joachimi on a project “Pseudo- $C_\ell$ likelihood for the Euclid galaxy survey”	UCL
	<b>Andrei Cuceu (undergrad)</b> , Co-supervisor with Dr Bruno Moraes on a Summer Internships (12 weeks)	
2018	project “Simultaneous constraints of Cosmology and redshift distribution from galaxy surveys and CMB data” (Funded by RAS)	UCL
2018	<b>Marion Thomas (undergrad)</b> , Co-supervisor on a Summer Internship (12 weeks) project “Synergies between Spectroscopic and Photometric Galaxy Surveys” (Funded by RAS)	UCL
2018	<b>Joshua Lawton (undergrad)</b> , Co-supervisor on a Summer Internship (12 weeks) project “Creating a Galaxy Clustering Catalogue with PanSTARRS”	UCL
2017	<b>Andrei Cuceu (undergrad)</b> , Co-supervisor with Dr Bruno Moraes on a Summer Internship (12 weeks) project “Cosmological Constraints from Supernova Surveys and Planck CMB data”	UCL

## Teaching Experience

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<b>University of Edinburgh</b>	Edinburgh, UK
TEACHING ASSISTANT - PHD LEVEL	2022
Teaching assistant at the PhD Hackathon on data analysis (2022)	
<b>University College London</b>	London, UK
TEACHING ASSISTANT - UNDERGRADUATE LEVEL	2016 - 2018
Practical Astronomy 2 (2017, 2018), Observational Astronomy 1 (2017), Practical Physics 2 (2017), Practical Skills for Astronomy (2016)	
<b>University of São Paulo</b>	São Paulo, BR
TEACHING ASSISTANT - UNDERGRADUATE LEVEL	2014 - 2015
Physical Cosmology (2015), Advanced Quantum Mechanics (2014)	
<b>Universidade Federal do Rio Grande do Sul</b>	Porto Alegre, BR
TEACHING ASSISTANT - UNDERGRADUATE LEVEL	2010 - 2013
Basic Astronomy (2011, 2013), Psychology of Education (2010)	
<b>Private</b>	Porto Alegre, BR
TUTOR - HIGH-SCHOOL LEVEL	2011 - 2013
Physics & Mathematics for high-school	

## Outreach

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<b>Project Collaborator for #AstroThreadBR and #AstroMiniBR</b>	Twitter
SOCIAL MEDIA ENGAGEMENT	2019-2022
Engagement with the science enthusiasts community in Brazil via the #AstroThreadBR and #AstroMiniBR projects using twitter threads to educate the general public about astronomy. Threads have, on average, a reach of 10-20k impressions.	
<b>Talk: “Weighing Ghost Particles with the Universe”</b>	YouTube
PUBLIC ENGAGEMENT TALK	2020
Outreach talk for Astronomy on Tap London, live on YouTube. URL: <a href="https://youtu.be/MLwBvdc675A">https://youtu.be/MLwBvdc675A</a>	

## Article: “Ghost particles: how galaxies helped us weigh the lightest neutrino”

The Conversation

PRESS RELEASE

Article published at The Conversation portal related to Loureiro et al. 2019b , informing the general public about the main results in the paper.

## Talk: “Hunting Ghosts with Galaxies”

Porto Alegre, BR

PUBLIC ENGAGEMENT TALK

Outreach talk at a high school about Cosmology, Neutrinos, and data science.

## If a Tree falls in the Forrest: Cosmology meets Art

Grizedale Forest, UK

ART EXHIBITION

Art exhibition in collaboration with the Royal College of Arts. Presentation of a workpiece "Confirmation of Time" in collaboration with the artist Franziska Hatton. URL: <http://ifatreefalls.rca.ac.uk>

## L'Observatoire Bizarre

London, UK

ROYAL ACADEMY OF ARTS LATES

Public engagement in collaboration with the Royal College of Arts at the Dada & Surrealism RA Late. Organised by Dr. Andrew Pontzen and Michaela French.

## Physics Club: “Time in Cosmology”

Porto Alegre, BR

PUBLIC ENGAGEMENT TALK

Outreach talk at the Physics Club, Universidade Federal do Rio Grande do Sul.

## Selected Talks

2023	<b>Dark Sector Cosmology Talk</b> , Jet Propulsion Lab, NASA/Caltech	Passadena, US
2023	<b>Cosmology Talk</b> , The Oskar Klein Centre, Stockholm University	Stockholm, SE
2022	<b>Talk at GR effects in observing the Large-Scale Structure of the Universe</b> , Universidade do Porto	Porto, PT
2022	<b>Cosmology Seminar</b> , Queen Mary University of London	London, UK
2022	<b>Cosmology Seminar</b> , University of Portsmouth	Portsmouth, UK
2021	<b>Cosmology Group Talk</b> , University of São Paulo	São Paulo, BR
2021	<b>Stobie Talk on Science Funding Crisis in Brazil</b> , University of Edinburgh	Edinburgh, UK
2021	<b>Cosmology Seminar at the PPGCosmo</b> , Federal University of Espírito Santo	Vitória, BR
2021	<b>Talk at the DES Harmonic Space Working Group</b> , Dark Energy Survey	Online
2021	<b>Cosmology Seminar</b> , CosmoStat, Commissariat à l'énergie atomique (CEA)	Saclay, FR
2021	<b>Cosmology Seminar</b> , Max Planck Institute for Astrophysics	Munich, GE
2020	<b>Talk at the Kilo Degree Survey Busy Week</b> , German Centre for Cosmological Lensing	Bochum, GE
2019	<b>Seminar at the Royal Observatory's Coffee Talks</b> , University of Edinburgh	Edinburgh, UK
2019	<b>Seminar at the EEP Group Meeting</b> , University of Sussex	Brighton, UK
2019	<b>Talk at the Spectroscopic Surveys Meeting</b> , University College London	London, UK
2019	<b>Talk at the Euclid Consortium Meeting</b> , University of Helsinki	Helsinki, FN
2018	<b>Talk at the Dark Energy Survey Collaboration Meeting</b> , University of Campinas	Campinas, BR
2018	<b>Astrophysics Seminar</b> , Universidade Federal do Rio Grande do Sul	Porto Alegre, BR
2018	<b>Department of Mathematical Physics Seminar</b> , University of São Paulo	São Paulo, BR
2018	<b>Astrophysics Seminar</b> , National Institute for Space Research	SJ dos Campos, BR
2018	<b>Seminar for UCL's Lunch Talks</b> , University College London	London, UK
2017	<b>Talk at the Dark Energy Survey Collaboration Meeting</b> , University of Chicago	Chicago, US
2018	<b>Talk at the Euclid Consortium Meeting</b> , University College London	London, UK
2017	<b>Talk at the Euclid UK Collaboration Meeting</b> , University of Portsmouth	Portsmouth, UK
2017	<b>Talk at the Euclid OU-LE3 Meeting</b> , Royal Astronomical Society	London, UK
2016	<b>Talk at the Dark Energy Collaboration Meeting</b> , Cambridge University	Cambridge, UK
2015	<b>Talk at the J-PAS Warm-up Meeting</b> , University of São Paulo	São Paulo, BR

## Event Organisation

### Euclid Collab. Meeting, Session on Field Level Inference

Copenhagen, DN

CO-ORGANISER

May/2023

### Euclid Weak Lensing Science Working Group Meeting

Edinburgh, UK

CO-ORGANISER

Dec/2022

### GR effects in observing the Large-Scale Structure of the Universe

Porto, PT

SESSION CHAIR

Jun/2022

### Cosmology and Extragalactic Seminars at UCL

London, UK

ORGANISER

Jan/2019 - Jan/2021

### Euclid CalWG, Garage Day & OU-LE3 Meeting

London, UK

ORGANISER

2017

### Euclid Consortium Meeting

London, UK

ORGANISATIONAL GROUP

2017

## References

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**Prof. Alan Heavens***Imperial College London*

CHAIR IN ASTROSTATISTICS

Contact: a.heavens@imperial.ac.uk

**Prof. Jens Jasche***Stockholm University*

ASSOCIATE PROFESSOR OF PHYSICS

Contact: jens.jasche@fysik.su.se

**Prof. Benjamin Joachimi***University College London*

READER IN ASTRONOMY

Contact: b.joachimi@ucl.ac.uk

**Prof. Andrew Jaffe***Imperial College London*

PROFESSOR OF ASTROPHYSICS AND COSMOLOGY AND DIRECTOR OF IMPERIAL CENTER FOR COSMOLOGICAL INFERENCE

Contact: a.jaffe@imperial.ac.uk

**Prof. L. Raul Abram***University of São Paulo*

PROFESSOR AT THE MATHEMATICAL PHYSICS DEPARTMENT

Contact: abramo@if.usp.br