Dr Natalia Porqueres

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FIELDS OF EXPERTISE

Data analysis: field-level inference, forward modelling, simulation-based inference, high-order statistics.
Cosmology: weak lensing, galaxy clustering, Lyman-α forest, systematics and contaminations.
Structure formation: reconstruction of the matter density, mass mapping, gravity models.
High-performance computing: inference of high-dimensional problems, MPI, OpenMP, GPUs.

EMPLOYMENT

1/12/2024 – date	**Researcher (faculty)** CosmoStat, Department of Astrophysics, IRFU, CEA
1/10/2022 – 30/11/2024	**Beecroft fellow** Department of Astrophysics, University of Oxford
1/10/2019 – 30/09/2022	**Postdoctoral Research Associate** Imperial Centre for Inference and Cosmology (ICIC), Imperial College
1/09/2016 – 30/09/2019	**PhD student, IMPRS fellow** Max Planck Institute for Astrophysics and Excellence Cluster Universe
1/06/2015 – 30/08/2015	**Internship with DAAD grant** Max Planck Institute for Astrophysics

EDUCATION

16/09/2019	**Dr. rer. nat., Astrophysics, Ludwig Maximilian University of Munich** Thesis: Inferring the growth of structures from high-redshift cosmological data sets Magna cum laude
06/07/2016	**MSc in Astrophysics and Cosmology, University of Barcelona**
30/07/2015	**BSc in Physics, University of Barcelona**

RESEARCH FUNDING

2025 **PI** of **ERC Starting Grant**, OCAPi (04/2026-03/2031), **1.5M €**
2023 **PI** of **DiRAC allocation** (04/2023-03/2024), **4.5M core-hours**
2022 **PI** of **Beecroft fellowship**, University of Oxford (10/2022-09/2025), **£ 153k**
2022 María Zambrano Postdoctoral Fellowship at UAB (declined)
2016 PhD student, **Hertha Sponer Studentship**, Excellence Cluster Universe (09/2016-10/2017), **30k €**
2015 Intern student, **Research Scholarship grant** from German Academic Exchange Service (DAAD), Max Planck Institute for Astrophysics (6/2015-08/2015), **2k €**.

ACADEMIC LEADERSHIP

Euclid Consortium: **Weak lensing Science Working Group lead** (since 2025).
DR1-KP-WL-7 coordinator (High-order weak-lensing statistics, since 2024).
Scientific editor in the Editorial Board (ECEB, since 2023).
LSST-DESC: **Lead** of Bayesian Pipelines topical team (since 2024).
Project lead of field-level approach (since 2022, DESC Project 306)
International Astrostatistics Association: **Elected vice president** for development (since 2024).
Aquila Consortium: **Lead** of weak lensing analysis (since 2020).

SUPERVISION

20/10/2025 – 19/10/2026	**Apprenticeship student** Fatoumata Seye CEA Saclay (student at école Centrale Nantes), 100% supervision
01/10/2025 – 30/09/2028	**PhD student** Seung-gyu Hwang (France Excellence Scholarship) CEA Saclay, U. Paris-Saclay , % co-supervision with J. L. Starck
01/10/2021 – 23/05/2025	**PhD student** Lucas Makinen (President's Scholarship) Imperial College London, 50% co-supervision with A. Heavens **3 publications** under my supervision
10/10/2023 – 30/04/2024	**MPhys student** Konstantin Dukats University of Oxford, 100% supervision
15/09/2023 – 01/12/2025	**BSc and MSc student** Iason Saganas Max Planck Institute for Astrophysics, 30% co-supervision with T. Enßlin **1 publication in preparation** under my supervision
01/06/2023 – 30/09/2023	**Intern MPhys student** Anya Paopiamsap (NARIT scholarship) University of Oxford, 50% co-supervision with D. Alonso **1 publication** under my supervision

LECTURING

2025 **ASTRODAT PhD school**, Durham: Bayesian inference (1.5h) and hands-on sessions (7h).
2025 **COLOURS PhD School**, Institute Pascal: field-level and simulation-based inference (3h).
2024 STFC-funded **Data Analysis PhD School**, Imperial College: 3 of 9 lectures (3h).
2024 **Heidelberg's Graduate Days**: PhD course (15-hour) on data analysis and the Euclid science case.
2023 STFC-funded **Data Analysis PhD School**, Imperial College: 3 of 8 lectures (3h).
2023 *Modern Astrostatistics*, Leiden University: compulsory **3 ECTS master course** (18h) with exam. Excellent teaching **evaluation: 8.4**.
2022 **Data Analysis PhD School**, Imperial College: hands-on sessions (23h) coordinator and 1h lecture.

TUTORING

2022 **Tutor** Astrophysics course (4th year students, 18h), University of Oxford.
2021 **Demonstrator** hands-on sessions at Data Analysis School (22h), Imperial College.
2020 **Demonstrator** Electromagnetism and Optics Lab (1st year students, 20h), Imperial College.

ORGANISATION OF ACADEMIC EVENTS

Chair of the 5th edition of the Cosmo21 conference series (2025)
Euclid FR meeting (SOC), Strasbourg (2025)
ASTRODAT workshop (SOC), University of Durham (2025)
Euclid 3x2 meeting (LOC and SOC), Paris Observatory (2025)
COLOURS school and workshop (SOC and LOC), Institut Pascal (2025)
Cosmology Seminar, University of Oxford (2023-2024)
Biannual Aquila Meeting in Oxford (2023)
STFC-funded Data Analysis School at Imperial College (2021-2023)
Monthly London Cosmology Discussion Meeting (LCDM) (2021-2022)
Euclid UK meeting (2019)

COMMITTEE INVOLVEMENT

PhD Jury: Examiner for Physics PhD defense Univerisité Paris-Saclay, 2025
PhD Jury: Examiner for Physics PhD defense, Universtiat Autonoma de Barcelona, 2025
Proposal reviewer for DiRAC High Performance Computing facilities (2024).
Elected member of the Aquila Consortium Editorial Advisory Group (2024-now and 2020-2021)
Internship admissions panel at University of Oxford (2024).
PhD hiring committee at Leiden University (2024).
Representative of Imperial College at the London Institute of Cosmology (2021-2022)
Referee MNRAS, A&A, JCAP, ApJ, OJA.

AWARDS AND HONORS

2023 Junior Research Fellowship, Wolfson College
2022 Seal of Excellence, European Commission, Marie Skłodowska-Curie Actions.
2019 International Max Planck Research School (IMPRS) certificate.
2015 La Pedrera - Institut de Ciències del Cosmos scholarship, University of Barcelona.

SELECTED TALKS FROM A TOTAL OF 37 INVITED TALKS

2025 "Big Data, Big Questions: The Future of Cosmological Surveys", keynote speaker, MIAPbP
2024 "Mock Barcelona" conference, Barcelona
2023 "Current challenges for cosmology" conference, Bucaramanga (remote)
2023 "New strategies for extracting cosmology" conference, keynote speaker, Sexten
2023 "Perspective on LSS" conference, Prague
2023 "Cosmology with large scale structure" conference, DIPC
2022 "Advances in cosmology through numerical simulations" conference, Munich
2022 "Weak lensing beyond 2 point" conference, Kyoto University (remote)
2020 "The Cosmic Web in the Local Universe" conference, Lorentz Center

PUBLIC ENGAGEMENT

2024 Co-organiser of the Astro Club at Wolfson College, Oxford.
2023 Cosmology talk and telescope observation, Wolfson College, Oxford.
2020 Cosmology talk at Featherstone High School (Ealing, London).
2018 Supervision of intern high-school students at the Max Planck Institute for Astrophysics.
2018 Dark energy outreach talk for high-school students at the Excellence Cluster Universe.

PUBLICATION LIST

Since the start of my PhD in 2016, I have authored a total of 17 papers, 8 of which as a first author and 4 first-authored by students I co-supervise (underlined below), with a total of 357 citations (h-index of 12).

1. "Euclid preparation: Towards a DR1 application of higher-order weak lensing statistics ", citations: 0
   S. Vinciguerra, F. Bouche, et al. (**N. Porqueres** in lead author group, 18th)
   (Submitted to A&A) (arXiv:2510.04953)

2. "Euclid: Field-level inference of primordial non-Gaussianity and cosmic initial conditions ", 11
   A. Andrews, J. Jasche, G. Lavaux, et al. (**N. Porqueres** in lead author group, 16th)
   (Submitted to A&A) (arXiv:2412.11945)

3. "Hybrid summary statistics", 9
   T. L. Makinen, S. Ce, B. Wandelt, **N. Porqueres**, A. Heavens
   (*ML4PS2024 at NeurIPS, 2024*) (arXiv:2410.07548)

4. "Hybrid summary statistics: neural weak lensing inference beyond the power spectrum", 7
   T. L. Makinen, A. Heavens, **N. Porqueres**, T. Charnock, A. Lapel, B. Wandelt
   (*Journal of Cosmology and Astroparticle Physics, 2025*) (arXiv:2407.18909)

5. "DISCO-DJ I: a differentiable Einstein-Boltzmann solver for cosmology ", 16
   O. Hahn, F. List, **N. Porqueres**
   (*Journal of Cosmology and Astroparticle Physics*, 2024) (arXiv:2311.03291)

6. "Accuracy requirements on intrinsic alignments for Stage-IV cosmic shear ", 10
   A. Paopiamsap, **N. Porqueres**, D. Alonso, J. Harnois-Deraps, D. Leonard
   (*Open Journal of Astrophysics*, 2024) (arXiv:2311.16812)

7. "Field-level inference of cosmic shear with intrinsic alignments and baryons", 39
   N. Porqueres, A. Heavens, D. Mortlock, G. Lavaux, T. Makinen
   (arXiv:2304.04785)

8. "LyAl-Net: A high-efficiency Lyman-α forest simulation with a neural network", 5
   C. Boonkongkird, G. Lavaux, S. Peirani, Y. Dubois, **N. Porqueres**, E. Tsaprazi
   (arXiv:2303.17939)

9. "The Cosmic Graph: Optimal Information Extraction from Large-Scale Structure using Catalogs", 35
   T. L. Makinen, T. Charnock, P. Lemos, **N. Porqueres**, A. Heavens, B. Wandelt
   (*Open Journal of Astrophysics*, 2022) (arXiv:2207.05202)

10. "Lifting weak lensing degeneracies with a field-based likelihood", 53
    N. Porqueres, A. Heavens, D. Mortlock, G. Lavaux
    (*Monthly Notices of the Royal Astronomical Society*, 2021) (arXiv:2108.04825)

11. "Bayesian forward modelling of cosmic shear data", 37
    N. Porqueres, A. Heavens, D. Mortlock, G. Lavaux
    (*Monthly Notices of the Royal Astronomical Society*, 2021) (arXiv:2011.07722)

12. "A hierarchical field-level inference approach to reconstruction from Lyman-α forest data", 25
    N. Porqueres, O. Hahn, J. Jasche, G. Lavaux
    (*Astronomy & Astrophysics*, 2020) (arXiv:2005.12928)

13. "Inferring high redshift large-scale structure dynamics from the Lyman-alpha forest", 33
    N. Porqueres, J. Jasche, G. Lavaux, T. Enßlin
    (*Astronomy & Astrophysics*, 2019) (arXiv:1907.02973)

14. "Explicit Bayesian treatment of unknown foreground contaminations in galaxy surveys", 24
    N. Porqueres, D. Kodi Ramanah, J. Jasche, G. Lavaux
    (*Astronomy & Astrophysics*, 2019) (arXiv:1812.05113)

15. "Imprints of the large-scale structure on AGN formation and evolution", 13
N. Porqueres, J. Jasche, T. Enßlin, G. Lavaux
(*Astronomy & Astrophysics*, 2018) (arXiv:1710.07641)

16. "NIFTy 3 - Numerical Information Field Theory", 32
T. Steininger, J. Dixit, P. Frank, M. Greiner, S. Hutschenreuter, J. Knollmüller, R. Leike, **N. Porqueres**, D. Pumpe, M. Reinecke, M. Sraml, C. Varady, T. Enßlin
(*Annalen der Physik*, 2019) (arXiv:1708.01073)

17. "Cosmic expansion history from SNe Ia data via information field theory", 11
N. Porqueres, T. Enßlin, M. Greiner, V. Böhm, S. Dorn, P. Ruiz-Lapuente, A. Manrique
(*Astronomy & Astrophysics*, 2017) (arXiv:1608.04007)