Maximilian von Wietersheim-Kramsta

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RESEARCH

Apr. 2024 -present **Postdoctoral Research Associate, Institute for Computational Cosmology & Centre for Extragalactic Astronomy, Durham University** (UK)
Large scale structure, dark matter, dark energy, cosmological inference, simulation-based inference, strong and weak gravitational lensing observations, charge transfer inefficiency in space telescopes, and statistical techniques for medical cancer research (*AI-VISION*). Active member of *Euclid* (SWG Weak Lensing and VIS), *Kilo-Degree Survey* (KiDS), *COSMOS-Web* and *Habitable Worlds Observatory*.

Jun. 2023 -Apr. 2024 **Postdoctoral Research Fellow, Cosmoparticle Initiative, Astrophysics Group, University College London** (UK)
Development of forward models for large-scale structure measurements by the Euclid Space Telescope (SGS LE3), and the Kilo-Degree Survey.

Jun.-Aug. 2018 **Research Intern, ICIC, Astrophysics Group**, **Department of Physics**, **Imperial College London** (UK)
Development of a novel Bayesian method together with to analyse spectra of gamma rays detected by the Fermi LAT.
Advisers: Dr Alex Geringer-Sameth, Prof. Roberto Trotta

Jun.-Aug. 2017 **Research Intern, ICIC, Astrophysics Group**, **Department of Physics**, **Imperial College London** (UK)
Development of an outreach map containing the location in space of most objects ever discovered from the low Earth orbit to the edge of the observable.
Adviser: Prof. Roberto Trotta

Jul. 2015 **Research Intern, Instituto de Astrofísica de las Canarias**, IAC (Spain)
Observation nights on the Teide (Tenerife) with the IAC-80 telescope.
Advisers: Dr Miquel Serra-Ricart, Juan Carlos Casado

Jul. 2014 **Research Intern, Centro de Astrofisica da Universidade do Porto**, CAUP (Portugal)
Computational analysis of supernovae and Hubble parameter data.
Adviser: Dr Carlos Martins

EDUCATION AND QUALIFICATIONS

2019-May 2023 **PhD in Physics and Astronomy, University College London** (UK)
Thesis: *'Forward-Simulations of Large-Scale Structure for Cosmological Inference'* - Development of realistic simulations of large-scale structure to inform the simulation-based inference (SBI) of cosmological parameters from the data of the Kilo-Degree Survey.
Advisers: Prof Benjamin Joachimi, Dr Andreu Font Ribera, Dr Stephen Feeney

2015-2019 **MSci Physics** (4-year course), **Imperial College London** (UK)
Specialisation: Cosmology, General Relativity, Information Theory, Quantum Field Theory and the Standard Model
Thesis: *'A Bayesian Approach to the Inference of the Stellar Mass of Galaxies from Large Photometric Surveys'* - Analysis of the COSMOS2015 catalogue using spectral energy distribution fitting to determine the galaxies stellar mass function and constrain cosmology.
Adviser: Prof Roberto Trotta

2009-2015 **Institut Manuel Sales i Ferré**, Ulldecona (Spain)
Título de Bachillerato with honours (secondary education for entry into higher education) and Educació Secundària Obligatòria, ESO (obligatory secondary education).

LEADERSHIP ROLES

Apr. 2024-Now **Coordinator of the VIS charge-transfer inefficiency efforts** - Euclid consortium
Execution and reporting of CTI calibration effort within OU-VIS.

2024-Now **Kilo-Degree Survey builder status** - KiDS consortium

Jun. 2023-Now **Coordinator of variable depth modelling project** - Euclid consortium
Execution and reporting of variable depth standard project within SGS LE3.

Jan. 2021-Now **Coordinator simulation-based inference & forward modelling team** - KiDS consortium
Execution and reporting of SBI and simulations for KiDS-1000 and Legacy.

PROFESSIONAL SERVICE

Oct. 2024-Now **Founder & organiser of *'Scraps of Science'* sessions** - Durham University (UK)
Fortnightly session where all members of the astronomy group discuss current research.

Oct. 2024-Now **Organiser of *'Lensing Lunch'* sessions** - Durham University (UK)
Fortnightly session to discuss and present gravitational lensing-related research.

2023-2024 **Journal referee, Monthly Notices to the Royal Astronomical Society and the Open Journal of Astrophysics**

May 2023 **Organiser & chair of a conference for KiDS consortium** - UCL Observatory (UK)
Organisation of a week-long KiDS consortium meeting and social activities.

Sep. 2021 - Jun. 2022 **Organiser of the cosmology journal club** - University College London (UK)
Weekly cosmology journal club at UCL. Development and implementation of the "hybrid" format which combined remote and in-person attendance.

Jan. - Jun.2021 **Organiser of the astrophysics lunch talks** - University College London (UK)
Organisation and moderation of the twice-per-term talks by internal and external speakers.

TEACHING EXPERIENCE

2024-Now **Workshop Demonstrator and Lead**, Durham University (UK)
Convening and demonstrating of two weekly workshops as part of the 2nd-year undergraduate course *'Theoretical Physics 2'* over two terms.

18 Nov. 2024 **Guest Lecturer,** Durham University (UK)
Guest lecture as part of the 2nd-year undergraduate course *'Theoretical Physics 2'*.

2015-2023 **Personal Tutor, Student Tutors Group Ltd and FirstTutors.co.uk,** London (UK)
Individual home tutoring/teaching for all students up to A-levels/IB in physics, maths, chemistry and languages. This work involved the preparation of lessons, the creation of study plans and practice material for exams, and the marking of homework.

2020-2021 **Postgraduate Teacher Assistant**, University College London (UK)
Tutorials for *'Maths methods'* and *'Atoms, Stars and the Universe'* courses (1st year UG).

2019-2020 **Postgraduate Teacher Assistant**, University College London (UK)
Marking for *'Physical cosmology'* course (3rd year UG).

OUTREACH

30-31 Oct. 2024 **Augmented and virtual reality stand on dark matter** - *Celebrate Science*, Durham (UK)
Stand at two-day science fair for all ages where people where shown cosmological simulations through VR headsets and an AR gravitational lensing demonstration.

9 Aug. 2024 **Augmented reality stand on strong gravitational lensing** - Durham University (UK)
Six-hour session to present strong gravitational lensing to secondary school students from the *OneUkraine* programme through an augmented reality demonstration.

6-8 Mar. 2020 **Outreach stand on dark matter** - *Your Universe: UCL Festival* (UK)
Creation of outreach posters on gravitational lensing and dark matter.
Presentation of short talks to primary and secondary school students over 3 days

18 Dec. 2018 **Talks on careers in STEM at a secondary school** - *Institut Manuel Sales i Ferré (Spain)*
Series of eight career talks given to secondary school students of all levels.

HONOURS, AWARDS AND GRANTS

2019-2023	**STFC PhD Studentship** - UK Research and Innovation	
2019	**Prize for best research proposal presentation** - Imperial College London	
2015	**Título de Bachillerato with honours** - Institut Manuel Sales i Ferré	
2013-2015	**Youth Science Program** - Catalunya-LaPedrera Foundation	
	Scholarship that funds courses and research in astronomy.	
2013-2014	**Becas Estudia en Canadá** - *Amancio Ortega Foundation*	
	Scholarship that finances an academic year (2013-14) in a Canadian high school. Grade 11 was completed at the Reynolds Secondary School in Victoria, British Columbia.	

PROFESSIONAL MEMBERSHIPS

2021-Now	**Fellow of the *Royal Astronomical Society***
2021-Now	**Member of the *European Astronomical Society***
2019-Now	**Associate of the *Royal College of Science***

TALKS AND SEMINARS

09/01/2025 - Conference talk on SBI in cosmology   *DEX XXI, Newcastle University* (UK)

08/11/2024 - Talk on SBI for strong and weak gravitational lensing   *FLAT, Durham University* (UK)

17/10/2024 - (Invited) Seminar on KiDS results   *Institut d'Astrophysique de Paris, Sorbonne U.* (France)

16/10/2024 - Talk on the CTI calibration   *OU-VIS Meeting, Euclid Consortium, Sorbonne U.* (France)

10/07/2024 - Conference talk on KiDS results   *CosmoVerse, Jagiellonian University in Krakow (Poland)*

27/06/2024 - (Invited) Cosmology seminar on KiDS results   *Queen Mary University of London (UK)*

18/06/2024 - Conference talk on SBI   *Euclid Consortium Meeting, Sapienza Università di Roma (Italy)*

21/05/2024 - Conference talk on KiDS results and SBI   *COSMO21, Chania (Greece)*

13/05/2024 - Conference talk on SBI   *UK Cosmology Meeting/Ruth Fest, King's College London (UK)*

15/04/2024 - Poster presentation   *Challenging the standard cosmological model, Royal Society (UK)*

10/04/2024 - Conference talk on LSS simulations   *SBI for galaxy evolution, University of Bristol (UK)*

27/03/2024 - (Invited) Talk on SBI and KiDS results   *University of Edinburgh (UK)*

12/03/2024 - (Invited) Talk on SBI and KiDS results   *Imperial College London (UK)*

21/02/2024 - (Remote) Talk on variable depth in Euclid cosmic shear   *University of Innsbruck (Austria)*

14/12/2023 - Talk on variable depth in Euclid cosmic shear   *Royal Astronomical Society (UK)*

16/11/2023 - Seminar on simulation-based inference (SBI)   *Durham University (UK)*

20/10/2023 - (Remote) Talk on the covariance of KiDS   *Inter-Science Taskforce: NL, Euclid consortium*

26/09/2023 - Seminar on SBI at a KiDS collaboration meeting   *Ruhr-University Bochum (Germany)*

09/03/2023 - (Invited) Seminar on SBI of cosmic shear   *Durham University (UK)*

05/10/2022 - Talk on SBI and numerical covariance at a KiDS meeting   *University of Hull (UK)*

18/05/2022 - Talk on SBI at a KiDS collaboration meeting   *NCNR/NCBJ, Warsaw (Poland)*

22/04/2022 - Conference talk on SBI of cosmic shear   *LFI in Paris, ENS (France)*

18/11/2021 - Co-chairing of discussion on KiDS variable depth   *University of Leiden (Netherlands)*

04/12/2020 - Seminar on statistical dimensionality reduction   *University College London (UK)*

23/11/2020 - (Remote) Talk on magnification bias at KiDS meeting   *Ruhr-Universität Bochum (Germany)*

11/03/2020 - (Invited) Talk on magnification bias   *University of Edinburgh (UK)*

POSTGRADUATE TRAINING

Sep. 2022	**B.U.S.S. in Theoretical Elementary Particle Physics** - Imperial College London (UK)	
Jun. 2021	**Summer School in Statistics for Astronomers** *(Remote)* - Penn State University (USA)	
Feb. -Jun. 2021	**PhD lecture programme**: astrostatistics, ML - University College London (UK)	
Jun. 2020	**Michigan Cosmology Summer School** *(Remote)* - University of Michigan (USA)	
Mar. -Apr. 2020	**Course on 'Stellar Structure and Evolution'** - University College London (UK)	

ADDITIONAL SKILLS

IT skills

- Proficient in, and comprehensive understanding of Python. Experienced in C++, bash, Mathematica and LaTeX. Familiar with SQL, R and HTML.
- Proficient understanding of Python scientific packages such as numpy, scipy, pandas, and matplotlib.
- Experienced in the use, deployment and development of machine learning algorithms/AI.

- Use of high-throughput computing: COSMA8, UCL Hypatia, Imperial HPC and U. of Edinburgh Cuillin.
- Implementation of parallel processes through MPI, OpenMP and multiprocessing.
- Collaborative coding and version management through git:
  - Development of *KiDS-SBI*, *KCAP-NonLimber*, *MAGBET* and *5param*.
  - Contributions to *VIS_CTI*, *GLASS* and *nonLimber_matter_shells*.

Language skills
- Proficient in reading, writing, speaking and listening of English, German, Spanish and Catalan.

PUBLICATIONS

(citations: 428, h-index: 8 according to *NASA ads*)

Reischke, R., Unruh, S., Asgari, M., Dvornik, A., Hildebrandt, H., Joachimi, B., Porth, L., **von Wietersheim-Kramsta M**., et al. (2024). KiDS-Legacy: Covariance validation and the unified OneCovariance framework for projected large-scale structure observables. *Submitted to A&A.*
> **Contributions**: Authorship of numerical covariance sections, coordinator of forward modelling efforts, development and testing of forward simulations, review of the manuscript.

Yan, Z., Wright, A. H., Chisari, N. E.,..., **von Wietersheim-Kramsta, M.** & Yoon, M. (2024). KiDS-Legacy: angular galaxy clustering from deep surveys with complex selection effects. *Submitted to A&A.*
> **Contributions:** Testing and discussion of variable depth, infrastructure contributions to KiDS.

Johnston, H., Chisari, N. E., Joudaki, S.,..., **von Wietersheim-Kramsta, M.**, Yan, Z. & Zhang, Y. H. (2024). 6x2pt: Forecasting gains from joint weak lensing and galaxy clustering analyses with spectroscopic-photometric galaxy cross-correlations. *Submitted to A&A.*
> **Contributions:** Infrastructure contributions to the Kilo-Degree Survey.

von Wietersheim-Kramsta, M., Lin, K., et al. (2024). KiDS-SBI: Simulation-Based Inference Analysis of KiDS-1000 Cosmic Shear. *Accepted by A&A.*
> **Contributions:** Main author, coordinator of the SBI efforts within the KiDS collaboration, development and testing of the full simulation pipeline.

Euclid Consortium (incl. **von Wietersheim-Kramsta, M.**) (2024). Euclid. I. Overview of the Euclid mission. *Accepted by A&A.*
> **Contributions:** Science Ground Segment and VIS instrument pipelines.

Tessore, N. , Loureiro, A., Joachimi, B., **von Wietersheim-Kramsta, M.**, & Jeffrey, N. (2023). GLASS: Generator for Large Scale Structure. *OJA*, 6, 11.
> **Contributions**: Testing of the module and implementation of intrinsic alignments.

Lin, K., **von Wietersheim-Kramsta, M.**, Joachimi, B. & Feeney, S. (2023). A simulation-based inference pipeline for cosmic shear with the Kilo-Degree Survey. *MNRAS*, 524(4), 6167-6180.
> **Contributions**: Second author, development of two sets of cosmological simulations.

Fortuna, M. C., Hoekstra, H., Johnston, H., ... & **von Wietersheim-Kramsta, M.** (2021). KiDS-1000: Constraints on the intrinsic alignment of luminous red galaxies. *A&A*, 654, A76.
> **Contributions:** Measurement of the magnification bias in the KiDS-1000 LRG sample.

von Wietersheim-Kramsta, M., Joachimi, B., van den Busch, J. L., Heymans, C., Hildebrandt, H., Asgari, M., ... & Wright, A. H. (2021). Magnification bias in galaxy surveys with complex sample selection functions. *MNRAS*, 504(1), 1452-1465.
> **Contributions**: Main author, development of the novel methodology to measure the magnification bias and application to KiDS-1000, HSC Wide and a stage-IV-like galaxy survey.

Joachimi, B., Lin, C. A.,..., **von Wietersheim-Kramsta, M.**, et al. (2021). KiDS-1000 methodology: Modelling and inference for joint weak gravitational lensing and spectroscopic galaxy clustering analysis. *A&A*, 646, A129.
> **Contributions**: Measurement of the magnification bias in the BOSS galaxy sample.

Martins, C. J. A. P., Pinho, A. M. M., Alves, R. F. C., Pino, M., Rocha, C. I. S. A., & **von Wietersheim-Kramsta, M.** (2015). Dark energy and equivalence principle constraints from astrophysical tests of the stability of the fine-structure constant. *JCAP*, 2015(08), 047.
> **Contributions:** Computational analysis of supernovae and Hubble parameter data and funding.