Anik Halder

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Education

April 2020 - present **Ph.D. candidate in Astrophysics**, *Ludwig-Maximilians-Universität München*, Germany.
Advisors: Dr. Stella Seitz, Prof. Ralf Bender
Thesis: *The integrated 3-point correlation functions of weak lensing and galaxy density fields*.
Expected graduation: Dec 2023.

Oct 2017 - March 2020 **M.Sc. Astrophysics**, *Ludwig-Maximilians-Universität München*, Germany.
Advisors: Dr. Oliver Friedrich, Dr. Stella Seitz
Thesis: *Position-dependent 2-point correlation function of lognormal random fields*.
Degree conferred on March 4, 2020. Graduated with an overall GPA of 1.02 .

Sep 2014 - June 2017 **B.Sc. Physics**, *Jacobs University Bremen*, Germany.
Advisors: Prof. Joachim Vogt, Prof. Peter Schupp
Thesis: *Multi-Scale Analysis of Auroral Currents Measured by the Swarm Satellite Mission*.
Degree conferred on June 9, 2017. Graduated with an overall GPA of 1.31 .

April 2012 - May 2014 **High School diploma**, *Hem Sheela Model School*, Durgapur, India.
Graduated with 96.6% in the All India Senior School Certificate Examination 2014 conducted by the Central Board of Secondary Education (CBSE), India.

Employment

Ludwig-Maximilians-Universität München, Germany

Jan 2019 - present **Teaching and Research Assistant**.
Advisor: Dr. Stella Seitz
- Conducting research projects in weak lensing cosmology.
- Mentoring student projects.
- Tutor for B.Sc. Physics, M.Sc. Astrophysics labs and courses.
- USM Extragalactic Astronomy research group seminar organiser and website maintainer.

Heinz Maier-Leibnitz Research Centre, Munich, Germany

Nov 2017 - Dec 2018 **Research Assistant**, Scientific Computing group.
Advisor: Dr. Joachim Wuttke
Development of the open-source software BornAgain - used for simulating and fitting small-angle scattering at grazing incidence.

Jacobs University Bremen, Germany

Sep 2015 - Sep 2017 **Teaching and Research Assistant**.
Advisors: Prof. Jürgen Fritz, Prof. Angelo Pio-Rossi
- Tutor for B.Sc. Physics courses.
- Development of an open-source Python interface for the visualisation and spectral analysis of data collected by the Mars Reconnaissance Orbiter for the PlanetServer project. Poster: *PlanetServer Python API - Visualization and Analysis of CRISM images* – 48th Lunar and Planetary Science Conference - USRA-Houston 2017, USA.
- Modelling the long range response in AC electricity grids due to change of power capacity of a transmission line in the grid for the CoNDyNet Project.

Instituto de Astrofisica de Canarias, Tenerife, Spain

June 2017 - Aug 2017 **Internship**, *DAAD RISE Weltweit Scholar 2017*.
Advisor: Dr. Jairo Abreu-Mendez
Quantifying the demographics of Boxy/Peanut structures in edge-on galaxies in the local Universe.

University of St Andrews, United Kingdom

June 2016 - Aug 2016 **Internship**, *DAAD RISE Weltweit Scholar 2016*.
Advisor: Prof. Christine Greif
Analysis and validation of realistic synthetic observations of star forming clouds.

Fraunhofer Institute for Laser Technology, Aachen, Germany

July 2015 - Aug 2015 **Internship**, Department of Lasers and Optics.
Advisor: Dr. Tobias Bonhoff
Validating models for thermal surface deformation of lenses by implementing different numerical algorithms.

Grants and Awards

2019 - present Successful high-performance computing grant proposals as project PI at the C2PAP supercomputing facility of the Excellence Cluster ORIGINS, Munich (overall $>$ 6.5 million CPU hours granted along with access to GPUs).

Dec 2022 Awarded travel grant for Early Career Scientists from the Dark Energy Survey (DES) collaboration to attend collaboration wide meeting.

March 2022 Successful grant proposal for supporting an international undergraduate student to complete a summer internship at LMU Munich under the DAAD RISE Germany scholarship scheme.

Nov 2020 Ranked in the top 10% of Ludwig-Maximilians-Universität München's graduating class of 2020 in recognition of the academic performance during the course of Master's study.

June 2017 Placed on the President's List of Jacobs University in recognition of the academic performance during the course of Bachelor's study.

2016, 2017 Awarded the DAAD RISE Weltweit Scholarships in 2016 and 2017 (two consecutive years) for conducting research projects in astronomy in institutions outside Germany.

2014 - 2017 Awarded Merit-based Scholarship for pursuing undergraduate studies at Jacobs University Bremen, Germany.

June 2014 Ranked in the Merit List (top 1%) of the country and qualified for Scholarship for Higher Education (INSPIRE) by virtue of performance in the Class XII (high-school graduation) AISSCE CBSE Examinations 2014, India (qualified and declined).

Sep 2013 Runner-Up in the 21st Prof. Brahm Prakash Memorial Materials Essay and Elocution Competition, Indian Institute of Metals Kalpakkam, among 6 finalists from all over India - for an essay on the topic 'Ancient Metallurgy in India'.

Talks

Given more than 20 talks at conferences, seminars, colloquia and collaboration meetings (including in-person and remote).

Selected Talks

April 2023 *The Integrated 3-point correlation function of projected cosmic density fields*, **Future Cosmology summer school, Cargese, France**.

Feb 2023 *The Integrated 3-point correlation function of cosmic shear*, **Astromerique Speaker Series, University of Montreal, Canada** *(remotely)*.

Jan 2023 *Response approach to the Integrated shear 3-point correlation function: impact of baryonic effects on small scales*, **Cosmo-Exgal seminar, University College London, UK.**

Jan 2023 *Response approach to the Integrated shear 3-point correlation function: impact of baryonic effects on small scales*, **Special Session on New Results from the Dark Energy Survey, 241st American Astronomical Society Meeting, Seattle, USA.**

May 2022 *Response approach to the Integrated shear 3-point correlation function: impact of baryonic effects on small scales*, **German Centre for Cosmological Lensing, Ruhr University Bochum, Germany** *(remotely)*.

April 2022 *Response approach to the Integrated shear 3-point correlation function: impact of baryonic effects on small scales*, **Cosmology with Weak Lensing: beyond the 2-point statistics, Yukawa Institute for Theoretical Physics, Kyoto University, Japan** *(remotely)*.

Feb 2022 *Response approach to the Integrated shear 3-point correlation function: impact of baryonic effects on small scales*, **Institute for Advanced Study, Princeton, New Jersey, USA** *(remotely)*.

Sep 2019 *Position-dependent 2-point correlation function of lognormal random fields*, **Workshop on Non-Gaussian Universe, University of Cambridge, UK.**

Teaching experience

Oct 2019 - present Tutor and grader at LMU Munich for B.Sc. Physics and M.Sc. Astrophysics labs. Designed and introduced the *Weak Gravitational Lensing* M.Sc. Astrophysics lab.

April - Aug 2023 Tutor and substitute lecturer at LMU Munich for the M.Sc. Astrophysics course *Formation and Evolution of Cosmic Structures*.

Sep 2015 - June 2017 Tutor and grader at Jacobs University Bremen for B.Sc. Physics courses: *Classical Physics, Modern Physics, Statistical Physics, Renewable Energy*.

Mentoring experience

April 2023 - present **David Gebauer** (currently M.Sc. student at LMU Munich), master's thesis: *Probing higher-order lensing statistics with simulation-based inference.*

June 2022 - Aug 2022 **Yue Pan** (currently graduate student at Princeton University), DAAD RISE Germany undergraduate intern at LMU Munich. Project: *Massive Data Compression on Convergence Two-Point Correlation Function.*

April 2020 - present **Zhengyangguang Gong** (currently Ph.D. candidate at LMU Munich), master's thesis and co-supervision of Ph.D. project. Master's project: *Constraining Neutrino Masses with Weak Lensing Convergence 2-point Correlation Function.*

Skills

Languages Bengali (native), English (bilingual), German (intermediate), Hindi (basic).

Programming c, c++, python, bash, High-performance computing

References

Dr. Alexandre Barreira, LMU Munich, Email: alex.barreira@origins-cluster.de

Prof. Dr. Ralf Bender, LMU Munich, Email: bender@mpe.mpg.de

Dr. Oliver Friedrich, LMU Munich, Email: Oliver.Friedrich@physik.uni-muenchen.de

Prof. Dr. Daniel Gruen, LMU Munich, Email: daniel.gruen@lmu.de

Prof. Dr. Eiichiro Komatsu, MPA Munich, Email: komatsu@MPA-Garching.MPG.DE

Dr. Ariel Sanchez, MPE Munich, Email: arielsan@mpe.mpg.de

Dr. Stella Seitz, LMU Munich, Email: stella@usm.lmu.de

Publications

3 first-author, 3 second-author (major contributions) and 1 minor contribution.

A. Barthelemy, A. **Halder**, Z. Gong, and C. Uhlemann, "Making the leap I: Modelling the reconstructed lensing convergence PDF from cosmic shear with survey masks and systematics,"

arXiv e-prints (submitted to JCAP) (July, 2023) , arXiv:2307.09468 [astro-ph.CO].

A. **Halder**, Z. Gong, A. Barreira, O. Friedrich, S. Seitz, and D. Gruen, "Beyond 3×2-point cosmology: the integrated shear and galaxy 3-point correlation functions," *arXiv e-prints (submitted to JCAP)* (May, 2023) , arXiv:2305.17132 [astro-ph.CO].

Z. Gong, A. **Halder**, A. Barreira, S. Seitz, and O. Friedrich, "Cosmology from the integrated shear 3-point correlation function: simulated likelihood analyses with machine-learning emulators," *J. Cosmology Astropart. Phys.* **2023** no. 7, (July, 2023) 040.

A. **Halder** and A. Barreira, "Response approach to the integrated shear 3-point correlation function: the impact of baryonic effects on small scales," *Monthly Notices of the Royal Astronomical Society* (July, 2022) .

O. Friedrich, A. **Halder**, A. Boyle, C. Uhlemann, D. Britt, S. Codis, D. Gruen, and C. Hahn, "The PDF perspective on the tracer-matter connection: Lagrangian bias and non-poissonian shot noise," *Monthly Notices of the Royal Astronomical Society* **510** no. 4, (January, 2022) 5069–5087.

A. **Halder**, O. Friedrich, S. Seitz, and T. N. Varga, "The integrated 3-point correlation function of cosmic shear," *MNRAS* (June, 2021) .

R. Marco Figuera, B. Pham Huu, A. P. Rossi, M. Minin, J. Flahaut, and A. **Halder**, "Online characterization of planetary surfaces: PlanetServer, an open-source analysis and visualization tool," *Planet. Space Sci.* **150** (Jan., 2018) 141–156.