Anik Halder

(he/him/his)

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Citizenship: Indian

Education

April 2020 - Feb 2024 **Ph.D. Physics**, *Ludwig-Maximilians-Universität München*, Germany.
Advisors: Dr. Stella Seitz, Prof. Ralf Bender
Thesis: *The integrated 3-point correlation functions of cosmic shear and projected galaxy density fields.*
Oral examination completed on Feb 09, 2024. Degree conferred on Feb 29, 2024.

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*.

Sep 2014 - June 2017 **B.Sc. Physics**, *Jacobs University Bremen*, Germany.
Advisors: Prof. Joachim Vogt
Thesis: *Multi-Scale Analysis of Auroral Currents Measured by the Swarm Satellite Mission*.

Employment

Max Planck Institute for Extraterrestrial Physics, Garching, Germany

Jan 2024 - present **Postdoctoral Researcher**, *Optical and Interpretative Astronomy (OPINAS) group*.
- Conducting research projects in weak lensing and galaxy clustering cosmology.
- Supervision of student research projects.

Ludwig-Maximilians-Universität München, Germany

Jan 2019 - Dec 2023 **Teaching and Research Assistant**, *Extragalactic Astronomy group*.
Advisor: Dr. Stella Seitz
- Conducting research projects in weak lensing cosmology.
- Supervision of student research projects, tutor for B.Sc. Physics, M.Sc. Astrophysics labs and courses.
- Extragalactic Astronomy research group seminar organiser and website developer.

Heinz Maier-Leibnitz Research Centre, Munich, Germany

Nov 2017 - Dec 2018 **Research Assistant**, *Scientific Computing group*.
Advisor: Dr. Joachim Wuttke
- Development of an open-source software BornAgain - for simulating small-angle x-ray scattering.

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 interface for visualisation and analysis of Mars Reconnaissance Orbiter data for the PlanetServer project. Poster: *PlanetServer Python API - Visualization and Analysis of CRISM images*, 48th Lunar and Planetary Science Conference - USRA-Houston 2017, USA.

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
- Model validation of thermal surface deformation of optical lenses due to laser beams.

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 $>$ 9.5 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 Bremen 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 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 All India Senior Secondary high-school graduation examinations 2014, India (*qualified and declined*).

Sep 2013 Runner-up in the 21st Prof. Brahm Prakash Memorial Materials Essay and Elocution High School 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 15 talks at conferences, seminars, colloquia and collaboration meetings (in-person and remote).

Selected Talks (outside Munich area)

May 2024 *The Integrated 3-point correlation function of projected cosmic density fields*, **18th Kosmologietag, Bielefeld, Germany**.

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 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

Dec 2023 - present **Yunhe Wang** (currently M.Sc. student at LMU Munich), research project: *The impact of non-standard dark matter models on gravitational lensing statistics.*

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: *MOPED data compression on lensing 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.*

Professional Service

Reviewer JCAP

Skills

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

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

Academic references

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

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

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

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

Prof. Jochen Weller, LMU Munich, Email: jochen.weller@lmu.de

Publications

8 refereed articles (including preprints currently in review):
3 first-author, 4 second-author (major contributions) and 1 minor contribution as final-author.

Z. Gong, A. **Halder**, A. Bohrdt, S. Seitz, and D. Gebauer, "C3NN: Cosmological correlator convolutional neural network – an interpretable machine learning tool for cosmological analyses," arXiv:2402.09526.

A. Barthelemy, A. **Halder**, Z. Gong, and C. Uhlemann, "Making the leap. Part I. Modelling the reconstructed lensing convergence PDF from cosmic shear with survey masks and systematics," *J. Cosmology Astropart. Phys.* **03** (Mar., 2024) 060, arXiv:2307.09468.

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," *J. Cosmology Astropart. Phys.* **2023** no. 10, (Oct, 2023) 028, arXiv:2305.17132.

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, arXiv:2304.01187.

A. **Halder** and A. Barreira, "Response approach to the integrated shear 3-point correlation function: the impact of baryonic effects on small scales," *MNRAS* **515** no. 3, (Sept., 2022) 4639–4654, arXiv:2201.05607.

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," *MNRAS* **510** no. 4, (Mar., 2022) 5069–5087, arXiv:2107.02300.

A. **Halder**, O. Friedrich, S. Seitz, and T. N. Varga, "The integrated three-point correlation function of cosmic shear," *MNRAS* **506** no. 2, (Sept., 2021) 2780–2803, arXiv:2102.10177.

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.