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EDUCATION

Ph.D. Physics (Cosmology)

Bielefeld University

📅 September 2025 – Present

Topic: Combining analytical and simulation-based methods to extract information from wide-area galaxy surveys

Supervisor: Prof. Dr. Cora Uhlemann

Expected Graduation: 2028

- Developing robust, simulation-based inference (SBI) methods for Higher Order Statistics.
- Focus on multi-probe cosmology and mitigating systematics for Stage-IV surveys (Euclid, LSST).

M.Sc. Astrophysics

LMU Munich

📅 April 2022 – October 2024

Final Grade: 1.15

Thesis: "Simulation Based Inference with the Integrated 3-Point Correlation Function of Cosmic Shear"

Supervisor: Dr. Stella Seitz

- Created a forward-modelling pipeline creating $\mathcal{O}(10^5)$ mock weak lensing maps.
- Developed CosmoFuse, a GPU accelerated Python package for measuring the integrated 3 point correlation function.
- Set up a simulation based inference framework.

B.Sc. Physics

LMU Munich

📅 October 2018 – March 2022

Thesis: "Dark Energy: Constraining cosmological models with extra spatial dimensions with Type Ia Supernovae"

Supervisor: Prof. Dr. Jochen Weller

- Coded likelihood for supernovae type Ia in C using GSL.
- Implemented Metropolis-Hastings Sampler in C.

PUBLICATIONS

Preprints & Published

C3NN-SBI: Learning Hierarchies of N -Point Statistics from Cosmological Fields with Physics-Informed Neural Networks

K. Lehman, Z. Gong, D. Gebauer, S. Seitz and J. Weller

📅 February 2026

📍 arXiv:2602.16768

🌐 doi.org/10.48550/arXiv.2602.16768

SBi3PCF: Simulation-based inference with the integrated 3PCF

D. Gebauer, A. Halder, S. Seitz and D. Anbajagane

📅 October 2025

📍 JCAP 06(2026)036

🌐 doi.org/10.1088/1475-7516/2026/06/036

Cosmology with second and third-order shear statistics for the Dark Energy Survey: Methods and simulated analysis

R. C. H. Gomes, S. Sugiyama, B. Jain, M. Jarvis, D. Anbajagane, M. Gatti, D. Gebauer, Z. Gong, A. Halder, G. A. Marques, S. Pandey, J. L. Marshall and DES Collaboration

📅 March 2025

📍 Phys. Rev. D 112, 123514

🌐 <https://doi.org/10.1103/3f1p-spfp>

C3NN: Cosmological Correlator Convolutional Neural Network – an interpretable machine learning tool for cosmological analyses

Z. Gong, A. Halder, A. Bohrdt, S. Seitz, D. Gebauer

📅 February 2024

📍 ApJ 971 156

🌐 doi.org/10.3847/1538-4357/ad582e

In Preparation

Dark Energy Survey Year 3: Cosmology with the Integrated 3-point Correlation Function of cosmic shear

A. Halder, Z. Gong, D. Gebauer, S. Seitz and DES Collaboration

📍 *in prep.*

SBi3PCF II: Cosmology from DES Y3 cosmic shear

D. Gebauer, A. Halder, C. Uhlemann and Z. Gong

📍 *in prep.*

Where the matter PDF keeps its cosmological information: an interpretable simulation-based inference study

D. Gebauer and C. Uhlemann

📍 *in prep.*

SCIENTIFIC SOFTWARE

CosmoFuse

🔗 D-Gebauer/CosmoFuse

- Designed and built a highly parallelized, GPU-accelerated framework in Python for extracting correlation functions directly from simulated weak-lensing maps.
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i3PCF Analytical Predictions

🔗 anikhalder/i3PCF

- Implemented observational effects into analytical theory code of i3PCF.
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RESEARCH EXPERIENCE

Research Assistant

Max Planck Institute for Extraterrestrial Physics (MPE)

📅 October 2024 – July 2025

📍 Garching

- Worked on validation and publication of the SBi3PCF weak lensing analysis.

COLLABORATIONS

Member of the Dark Energy Survey (DES), the Euclid Consortium, and the LSST Dark Energy Science Collaboration (DESC).

ACADEMIC MENTORING & TEACHING

Supervision of Bachelor's Thesis

Bielefeld University

📅 Summer Semester 2026

- **Topic:** Comparing Constraining Power of One-Point Weak Lensing Statistics with Simulation-Based Inference.

Lab Course Supervisor

LMU Munich

📅 April – July 2021 & April – July 2022

- Supervised the physics laboratory course for medical students and graded experimental reports.

FELLOWSHIPS & AWARDS

Wilhelm and Else Heraeus Communication Programme

Wilhelm and Else Heraeus Foundation

📅 2026

- Travel grant to attend and present at the DPG Spring Meeting 2026 in Erlangen.

Dark Energy Survey (DES) Spring 2024 Award

📅 2024

- Awarded a competitive travel grant to attend and present at the DES International Collaboration Meeting in Spain.

SELECTED PRESENTATIONS & TALKS

The Non-Gaussian Universe

FORTH

📅 June 2026

📍 Heraklion, Crete

Talk: "Simulation-Based Inference with the Integrated 3PCF".

Kosmologietag

Wissenswerkstadt Bielefeld

📅 May 2026

📍 Bielefeld

Talk: "Simulation-Based Inference with the Integrated 3PCF".

DPG Spring Meeting

German Physical Society (DPG)

📅 March 2026

📍 Erlangen

Talk: "Simulation-Based Inference with the Integrated 3PCF".

LSST JuDO

LSST Virtual Collaboration Meeting

📅 February 2026

📍 Virtual

Talk: "Simulation-Based Inference with Higher-Order Weak Lensing Statistics".

Euclid Welcome Session

📅 January 2026

📍 Virtual

Talk: "Simulation-Based Inference with Higher-Order Weak Lensing Statistics".

Cambridge-LMU Cosmology Workshop

LMU Munich

📅 September 2025

📍 Munich

Talk: "Simulation-Based Inference with the i3PCF".

Origins Lensing Day

Munich Institute for Astro-, Particle- and BioPhysics

📅 November 2024

📍 Garching

Talk: "Simulation-Based Inference with Higher-Order Weak Lensing Statistics".

Cambridge-LMU Cosmology Workshop

University of Cambridge

📅 October 2024

📍 Cambridge, UK

Talk: "Simulation-Based Inference with Higher-Order Weak Lensing Statistics".

Dark Energy Survey Collaboration Meeting

Dark Energy Survey

📅 May 2024

📍 S'Agaró, Spain

Talk in the "Beyond 2-Point" session about the integrated 3-point correlation function.