

Jonas Glombitza

*Postdoc,
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Education

- 2017 – 2021 **Ph.D. in physics**, *RWTH Aachen University*, Germany.
- Graduated *summa cum laude* on 17 December 2021.
 - Thesis: “Deep-Learning based Measurement of the Mass Composition of Ultra-high Energy Cosmic Rays using the Surface Detector of the Pierre Auger Observatory”, advised by Prof. M. Erdmann.
- 2015 – 2017 **Master’s degree in physics**, *RWTH Aachen University*, Germany.
- Graduated with distinction (1,2).
 - Focus of study: particle physics, astrophysics.
 - Thesis: “A Deep Learning-Based Reconstruction of Air Showers at the Pierre Auger Observatory.”
- 2012 – 2015 **Bachelor’s degree in physics**, *RWTH Aachen University*, Germany.
- Thesis: “Charge Reconstruction of Heavy Ions in Monte Carlo Simulations of the AMS-02 Experiment”, Grade: 1.8.

Experience

- since 2022 **Postdoctoral Researcher**, *Erlangen Centre for Astroparticle Physics, Friedrich-Alexander-University*, Gamma-ray group of Prof. Stefan Funk. Teaching and supervision of master, and Ph.D. students.
Research:
- Deep-learning-based reconstruction algorithms for ground-based gamma-ray and cosmic-ray observatories (H.E.S.S., CTAO, SWGO, Auger).
 - Mass composition of cosmic rays at very high and ultra-high energies.
 - Sensitivity optimization of gamma-ray observatories.
- Sep – Dec 2025 **Visiting Researcher**, *University of Maryland*, College Park, US.
Simulation and optimization of water-Cherenkov detectors for the Southern Widefield Gamma-Ray Observatory. Collaboration with Prof. J. Goodman and Dr. A. Smith.
- Apr – Jul 2025 **Research Affiliate / Visiting Researcher**, *NERSC, Lawrence Berkeley National Lab, Stanford University*, US.
Investigation of weakly-supervised learning algorithms to increase the robustness of deep-learning-based techniques in gamma-ray astronomy. Collaboration with Prof. B. Nachman and Prof. V. Mikuni.

- Jan – Apr 2024 **Research Affiliate**, *Lawrence Berkeley National Lab*, Berkeley, US.
Exploration of point-cloud transformers for high-energy gamma-ray astronomy. Application of diffusion models to air-shower simulations. Collaboration with Prof. B. Nachman and Prof. V. Mikuni.
- 2017 – 2022 **Research Assistant**, *III. Physics Institute A, RWTH Aachen University*.
Lecturing, supervision of bachelor and master students, assistance in the organization of workshops.
Research:
- Mass composition of ultra-high-energy cosmic rays.
 - Application of machine learning algorithms in particle physics.
 - Acceleration of simulations using generative models.
 - Domain adaptation using adversarial frameworks.
- summer 2016 **Summer Student**, *DESY, Hamburg, Germany*.
Investigated the impacts of muon backgrounds on the detector performance for future linear colliders.
- 2016 – 2017 **Student Assistant**, *III. Physics Institute A, RWTH Aachen University*.
- Experimental physics IV
 - Astroparticle physics
 - Physics for engineers
- 2015 – 2016 **Lab course Assistant**, *I. Physics Institute B, RWTH Aachen University*.

Memberships

- since 2023 **SWGO Collaboration**.
- since 2022 **CTAO Consortium**.
- since 2022 **H.E.S.S. Collaboration**.
- 2017 – 2024 **Pierre Auger Collaboration**.

Services

- since 2023 **Coordinator Analysis and Simulation**, *SWGO Collaboration*.
Coordination of the working group that investigates fundamental data analysis, event reconstruction, IRF productions, and detector simulations.
- since 2022 **Board member**, *Big Data Analytics*, representative for KAT (*Komitee für Astroteilchenphysik*).
- since 2022 **Reviewer**, *Astroparticle Physics*, *Physical Review D*, *Journal of Instrumentation*, *The European Physical Journal C*, *Experimental Astronomy*.
- 2020–2024 **Coordinator machine learning task**, *Pierre Auger Collaboration*.
Coordination of the working group that investigates new data-driven methods and their application in astroparticle physics. Organization of machine learning workshops and group meetings.

Awards

- 2025 **FAUeti**, *Selected for the Emerging Talents Initiative at the Friedrich-Alexander-University.*
- 2022 **Borchers Award**, *Awarded to doctoral students at RWTH Aachen who passed their PhD examination “with distinction”.*

Teaching

- 2024 – 2025 **Teaching assistant**, *Experimental Physics I*, Friedrich-Alexander-University.
- 2022 – 2024 **Teaching assistant**, *Physik für Mediziner*, Friedrich-Alexander-University.
- 2023 **Teaching assistant**, *Particle and Astroparticle Physics*, Friedrich-Alexander-University.
- 2018 – 2022 **Lecturer**, *Deep Learning in Physics Research*, master course (120 students), every summer term, RWTH Aachen University.
Lecturing, preparing course content, designing and grading of exercises, and course organization
- 2017 **Teaching assistant**, *Astroparticle Physics*, RWTH Aachen University.

Computer Skills

Coding Python, NumPy, Torch, TensorFlow, Keras, PyTorch Geometric, git, Docker

Office L^AT_EX, Word, Excel, Powerpoint

Languages

German Mother's tongue

English Native or bilingual proficiency

French Limited working proficiency

Community Activities

2013 Freshmen tutoring

2010 – 2012 Youth Leader

See separate pages for publications, invited talks, lectures, and conference contributions. A detailed list of publications can be found at <https://inspirehep.net/authors/1841002?ui-citation-summary=true>.

Books

- [Book1] M. Erdmann, J. Glombitza, G. Kasieczka, and U. Klemradt, *Deep Learning for Physics Research*. WORLD SCIENTIFIC, 2021. ISBN: 978-981-12-3747-8.

Publications (with significant contribution)

- [1] A. Abdul Halim (Pierre Auger Collaboration) et al., “Inference of the Mass Composition of Cosmic Rays with energies from $10^{18.5}$ to 10^{20} eV using the Pierre Auger Observatory and Deep Learning,” *Phys. Rev. Lett.*, vol. 134, no. 2, 2024.
- [2] A. Abdul Halim (Pierre Auger Collaboration) et al., “Measurement of the Depth of Maximum of Air-Shower Profiles with energies between $10^{18.5}$ and 10^{20} eV using the Surface Detector of the Pierre Auger Observatory and Deep Learning,” *Phys. Rev. D*, vol. 111, no. 2, 2025.
- [3] J. Glombitza, M. Schneider, F. Leidl, S. Funk, and C. van Eldik, “Application of graph networks to a wide-field water-cherenkov-based gamma-ray observatory,” *JCAP*, no. 11, 2024.
- [4] C. Elflein, S. Funk, and J. Glombitza, “Ultra-Fast Generation of Air Shower Images for Imaging Air Cherenkov Telescopes using Generative Adversarial Networks,” *Journal of Instrumentation*, vol. 19, no. 04, p. P04010, 2024.
- [5] J. Glombitza, V. Joshi, B. Bruno, and S. Funk, “Application of graph networks to background rejection in Imaging Air Cherenkov Telescopes,” *JCAP*, vol. 2023, no. 11, p. 008, 2023.
- [6] A. Aab et al. (Pierre Auger Collaboration), “Deep-learning based reconstruction of the shower maximum X_{\max} using the water-cherenkov detectors of the Pierre Auger Observatory,” *JINST*, vol. 16, no. 07, p. P07019, 2021.
- [7] A. Coleman et al., “Ultra high energy cosmic rays the intersection of the cosmic and energy frontiers,” *Astropart. Phys.*, vol. 147, p. 102794, 2023.
- [8] T. Bister et al., “Identification of patterns in cosmic-ray arrival directions using dynamic graph convolutional neural networks,” *Astropart. Phys.*, vol. 126, p. 102527, 2021.
- [9] M. Erdmann, J. Glombitza, and T. Quast, “Precise simulation of electromagnetic calorimeter showers using a wasserstein generative adversarial network,” *Comput Softw Big Sci.*, vol. 3, no. 4, 2019.

- [10] M. Erdmann, J. Glombitza, and D. Walz, “A deep learning-based reconstruction of cosmic ray-induced air showers,” *Astropart. Phys.*, vol. 97, pp. 46–52, 2018.
- [11] M. Erdmann, L. Geiger, J. Glombitza, and D. Schmidt, “Generating and refining particle detector simulations using the wasserstein distance in adversarial networks,” *Comput Softw Big Sci.*, vol. 2, no. 4, 2018.
- [12] L. Benato et al., “Shared data and algorithms for deep learning in fundamental physics,” *Comput Softw Big Sci.*, vol. 6, no. 1, 2022.

Proceedings

- [Proc1] J. Glombitza on behalf of the Pierre Auger Collaboration, “Air-Shower Reconstruction at the Pierre Auger Observatory based on Deep Learning,” *PoS*, vol. ICRC2019, p. 270, 2019.
- [Proc2] M. Erdmann and J. Glombitza, “Deep learning based algorithms in astroparticle physics,” *Journal of Physics: Conference Series*, vol. 1525, p. 012112, apr 2020.
- [Proc3] J. Glombitza on behalf of the Pierre Auger Collaboration, “Event-by-event reconstruction of the shower maximum X_{\max} with the Surface Detector of the Pierre Auger Observatory using deep learning,” *PoS*, vol. ICRC2021, p. 359, 2021.
- [Proc4] J. Glombitza on behalf of the Pierre Auger Collaboration, “Mass Composition from 3 EeV to 100 EeV using the Depth of the Maximum of Air-Shower Profiles Estimated with Deep Learning using Surface Detector Data of the Pierre Auger Observatory,” *PoS*, vol. ICRC2023, p. 278, 2023.
- [Proc5] J. Glombitza, V. Joshi, B. Bruno, and S. Funk, “Application of graph networks to γ /hadron separation in IACT image analyses,” *PoS*, vol. ICRC2023, p. 715, 2023.
- [Proc6] C. Elflein et al., “Generation of Air Shower Images for Imaging Air Cherenkov Telescopes using Diffusion Models,” *ML4PS Workshop NeurIPS*, p. 206, 2024.
- [Proc7] J. Glombitza behalf of the SWGO Collaboration, “Finalizing the Design of the Southern Wide-field Gamma-ray Observatory,” *PoS*, vol. ICRC2025, p. 661, 2025.

Invited Talks and Lectures (selected)

- 2025 **DPG spring meeting**, Göttingen, Germany, ‘Physics in the century of big data’ (invited ‘Hauptvortrag’).

- 2025 **Machine learning workshop**, *Newark, United States*, Deep Learning for astroparticle physics (invited review).
- 2025 **KIPAC Tea**, *Stanford, US*, Seminar talk: “The Southern Widefield Gamma-ray Observatory”.
- 2024 **Machine learning for Astrophysics 2nd edition**, *Catania, Italy*, review talk: “Deep Learning in Astroparticle Physics” (invited).
- 2024 **13th CRIS-MAC Conference**, *Trapani, Italy*, review talk: “Astroparticle Physics and Deep Learning” (invited).
- 2024 **CTEQ School**, *Bramsche, Germany*, lecture: “Introduction to machine learning for physicists” (invited lecture series).
- 2024 **Seminar talk**, *Berkeley CA, United States*, lecture: “Deep Learning in Astroparticle Physics”.
- 2023 **Guest Lecture at Utrecht University**, *Utrecht, The Netherlands*, lecture: “Machine Learning for Astrophysics”.
- 2023 **Active Training Course**, *Meinerzhagen, Germany*, lecture: “Graph neural networks for physics application”.
- 2022 **11th IDPASC School**, *Olomouc, Czech Republic*, lecture: “Introduction to Machine Learning”.
- 2022 **Astroparticle School**, *Obertrubach-Bärnfels, Germany*, lecture: “Machine learning for astrophysics”.
- 2022 **CPPS seminar**, *Siegen, Germany*, ‘From Machine Learning to Deep Learning in Physics’.
- 2022 **BND School**, *Callantsoog, The Netherlands*, lecture: Deep Learning for Physics Research (invited lecture series).
- 2022 **Train the trainer workshop**, *Wuppertal, Germany*, lecture: “Introduction to graph neural networks for future deep-learning lecturer”.
- 2022 **Deep Learning Week Ångströmlaboratoriet**, *Uppsala, Sweden*, lecture: ‘Generative Adversarial Networks’ (invited lecture series).
- 2022 **Train the trainer workshop**, *Aachen, Germany*, lecture: “Introduction to neural networks introspection for future deep-learning lecture”.
- 2022 **Machine learning workshop**, *Newark, United States*, “Deep Learning and astroparticle physics” (invited review).
- 2021 **The Paris-Saclay AstroParticle Symposium 2021**, *Paris, France*, invited lecture: “Machine learning for cosmic ray physics”.
- 2021 **Physics seminar**, *Prague, Czech Republic (online)*, ‘Deep Learning for Cosmic-Ray Observatories’.
- 2021 **2nd Terrascale School on Machine Learning**, *Hamburg, Germany (online)*, invited lecture: “Generative Adversarial Networks for fundamental physics”.

- 2021 **Physics seminar**, *Linnaeus University, Sweden (online)*, “Generative Adversarial Networks for Physics Research”.
- 2020 **Big Data Science in Astroparticle Research**, *Aachen, Germany*, lecture: “Graph neural networks”.
- 2019 **3rd inter-experimental machine learning workshop**, *CERN, Geneva, Switzerland*, invited lecture: “Generative Adversarial Networks and techniques”.
- 2019 **CMS Physics Object school**, *Aachen*, tutorial: “Introduction to deep neural networks”.
- 2019 **Big Data Science in Astroparticle Research**, *Aachen, Germany*, lecture: “Introduction to Deep Learning”.
- 2018 **1st Terrascale Workshop on Machine Learning**, *Hamburg, Germany*, lecture: “Introduction to Adversarial frameworks”.
- 2018 **Phenomenology Seminar**, *Heidelberg, Germany*, Seminar talk: “Deep Learning in Physics Research”.
- 2018 **Big Data Science in Astroparticle Research**, *Aachen, Germany*, lecture: “Generative models”.

Conference Contributions (selected)

- 2025 **39th International Cosmic Ray Conference**, *Geneva, Switzerland*, talk: “Finalizing the Design of the Southern Wide-field Gamma-ray Observatory”.
- 2024 **EuCAIF Conference**, *Amsterdam, The Netherlands*, poster: “Deep learning for Cosmic ray observatories”.
- 2023 **38th International Cosmic Ray Conference**, *Nagoya, Japan*, talk: “Mass Composition from 3 EeV to 100 EeV using the Depth of the Maximum of Air-Shower Profiles Estimated with Deep Learning using Surface Detector Data of the Pierre Auger Observatory”.
- 2021 **37th International Cosmic Ray Conference**, *Berlin, Germany (online)*, talk: “Event-by-event reconstruction of the shower maximum with the Surface Detector of the Pierre Auger Observatory using deep learning”.
- 2021 **Quarks 2020**, *Pereslavl, Russia (online in January)*, talk: “Deep learning for astroparticle physics” (invited).
- 2019 **AI for Science, Industry and Society**, *Mexico City, Mexico*, talk: “Deep Learning for Cosmic-Ray Observatories” (invited).
- 2019 **36th International Cosmic Ray Conference**, *Madison, USA*, poster: “Air-Shower Reconstruction at the Pierre Auger Observatory based on Deep Learning”.

- 2019 **International Workshop on Advanced Computing and Analysis Techniques in Physics Research**, *Saas-Fee, Switzerland*, talk: “Deep Learning based Algorithms in Astroparticle Physics”.
- 2018 **2nd inter-experimental machine learning workshop**, *CERN, Switzerland*, talk: “Refining Detector Simulations using Adversarial Networks”.
- 2018 **Astroparticle Physics in Germany**, *Mainz, Germany*, poster: “Investigation of Deep Learning based Algorithms at the Pierre Auger Observatory”.