Jonas Glombitza

Postdoc,
Erlangen Centre for
Astroparticle Physics

Nikolaus-Fiebiger-Straße 2
91058 Erlangen
+49 9131 85-27095
jonas.glombitza@fau.de
www.jonas-glombitza.com

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 Martin 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

spring 2024 **Research Affiliate**, *Lawrence Berkeley National Lab*, Berkeley, US.
Investigation of weakly-supervised learning algorithms to increase the robustness of deep-learning-based techniques in high-energy astronomy.

since 2022 **Postdoctoral Researcher**, *Erlangen Centre for Astroparticle Physics, Friedrich-Alexander-University*.
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., CTA, SWGO, Auger).
- Mass composition of cosmic rays at very high and ultra-high energies.
- Sensitivity optimization of gamma-ray observatories.

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 at DESY**, *Hamburg, Germany*.
Project: "The impacts of the muon spoiler background for the ILC detector performance".

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 **CTA Consortium**.

since 2022 **H.E.S.S. Collaboration**.

2018 – 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 and Grants

2022 **Borchers Award**, *Awarded to doctoral students at RWTH Aachen who passed their PhD examination "with distinction"*.

2025 **FAUeti**, *Selected for the Emerging Talents Initiative at the Friedrich-Alexander-University*.

Teaching

2022 – 2024 **Experimental Physics I**, *Teaching assistant*, Friedrich-Alexander-University.

2022 – 2024 **Physik für Mediziner**, *Teaching assistant*, Friedrich-Alexander-University.

2023 **Particle and Astroparticle Physics**, *Teaching assistant*, Friedrich-Alexander-University.

2018 – 2022 **Deep Learning in Physics Research**, *master course (120 students), every summer term*, RWTH Aachen University, lecturer.
Lecturing, preparation, and correction of exercises, course organization.

2017 **Astroparticle Physics**, *Teaching assistant*, RWTH Aachen University.

Computer Skills

Coding	Python, NumPy, Torch, TensorFlow, Keras, PyTorch Geometric, git, Docker
Office	LaTeX, 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. Leitl, 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," *submitted to JINST*, 2023.

[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.

Invited Talks and Lectures (selected)

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

2024 **Machine learning workshop**, *Newark, United States*, Deep Learning for astroparticle physics (invited review).

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, Geneve, 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)

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 **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”.