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 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

since 2022 **Postdoctoral Researcher**, *Erlangen Centre for Astroparticle Physics, Friedrich-Alexander-University*.

Teaching and supervision of bachelor, 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, Pierre Auger).
- Mass composition of cosmic rays at very high and ultra-high energies.
- Acceleration of simulations using generative models.

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 2022 **CTA Consortium**.

since 2022 **SWGO Collaboration**.

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

since 2018 **Pierre Auger Collaboration**.

Services

since 2022 **Board member**, *Big Data Analytics, representative for KAT (Komitee für Astroteilchenphysik)*.

since 2022 **Reviewer**, *Astroparticle Physics, Journal of Instrumentation, The European Physical Journal C*.

since 2020 **Leader 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.

Computer Skills

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

Office LaTeX, Word, Excel, Powerpoint

Teaching

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.

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.

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] J. Glombitza et al., "Application of Graph Networks to background rejection in Imaging Air Cherenkov Telescopes," *ArXiv:2305.08674*, 2023.

[2] 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, p. P07019, jul 2021.

[3] A. Coleman et al., "Ultra high energy cosmic rays the intersection of the cosmic and energy frontiers," *Astroparticle Physics*, vol. 147, p. 102794, 2023.

[4] T. Bister et al., "Identification of patterns in cosmic-ray arrival directions using dynamic graph convolutional neural networks," *Astroparticle Physics*, vol. 126, p. 102527, 2021.

[5] M. Erdmann, J. Glombitza, and T. Quast, "Precise simulation of electromagnetic calorimeter showers using a wasserstein generative adversarial network," *T. Comput Softw Big Sci.*, vol. 3, no. 4, 2019.

[6] 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.

[7] 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.

[8] J. Glombitza for the Pierre Auger Collaboration, "Air-shower reconstruction at the Pierre Auger Observatory based on deep learning," *PoS*, vol. 358, 2019.

[9] L. Benato et al., "Shared data and algorithms for deep learning in fundamental physics," *Computing and Software for Big Science*, vol. 6, may 2022.

[10] M. Erdmann and J. Glombitza, "Deep learning based algorithms in astroparticle physics," *Journal of Physics: Conference Series*, vol. 1525, p. 012112, apr 2020.

Invited Talks and Lectures (selected)

2023 **Guest Lecture at Utrecht University**, *Utrecht, The Netherlands*, Machine Learning for Astrophysics.

2022 **11th IDPASC School**, *Olomouc, Czech Republic*, Lectures on Machine Learning.

2022 **Astroparticle School**, *Obertrubach-Bärnfels, Germany*, Lectures on Machine Learning.

2022 **CPPS seminars**, *Siegen, Germany*, From Machine Learning to Deep Learning in Physics.

2022 **Lecture at School for Astroparticle Physics**, *Utrecht, The Netherlands*, Deep Learning for Astroparticle Physics.

2022 **BND School**, *Callantsoog, The Netherlands*, Lecture: Deep Learning for Physics Research.

2022 **Train the trainer workshop**, *Wuppertal, Germany*, Introduction to graph neural networks for future deep-learning docents.

2022 **Deep Learning Week Ångströmlaboratoriet**, *Uppsala, Sweden*, Lecture and tutorial on Generative Adversarial Networks.

2022 **Train the trainer workshop**, *Aachen, Germany*, Introduction to neural networks introspection for future deep-learning docents.

2022 **Workshop on Machine Learning for Cosmic-Ray Air Showers**, *Delaware, USA*, Talk: Deep Learning for Astroparticle Physics.

2021 **The Paris-Saclay AstroParticle Symposium 2021**, *Paris, France*, Machine learning tutorial.

2021 **Physics seminar**, *Prague, Czech Republic*, Deep Learning for Cosmic-Ray Observatories.

2021 **2nd Terrascale School on Machine Learning**, *Hamburg, Germany*, Tutorial on Generative Adversarial Networks.

2021 **Physics seminar**, *"Generative Adversarial Networks for Physics Research"*, Linnaeus University, Sweden.

2020 **Big Data Science in Astroparticle Research**, *Aachen, Germany*, Lecture on graph neural networks.

2019 **3rd inter-experimental machine learning workshop**, *CERN, Geneve, Switzerland*, lecture on Generative Adversarial Networks.

2019 **CMS Physics Object school**, *Aachen*, tutorial on Deep Learning.

2019 **Big Data Science in Astroparticle Research**, *Aachen, Germany*, Lecture: "Introduction to Deep Learning".

2018 **1st Terrascale Workshop on Machine Learning**, *Hamburg, Germany*, Lecture on adversarial frameworks.

2018 **Phenomenology Seminar**, *Heidelberg, Germany*, Seminar talk: "Deep Learning in Physics Research".

2018 **Big Data Science in Astroparticle Research**, *Aachen, Germany*, Lecture on generative models.

Conference Contributions (selected)

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)*, talk: "Deep learning for astroparticle physics".

2019 **Artificial Intelligence for Science, Industry and Society**, *Mexico City, Mexico*, talk: "Deep Learning for Cosmic-Ray Observatories".

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".