

# Jonas Glombitza

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*PhD student, RWTH Aachen University*

## Education

- 2017 – Today **PhD in physics**, *RWTH Aachen University*, Germany.  
Thesis: “Deep-Learning based Measurement of the Mass Composition of Ultra-high Energy Cosmic Rays using the Surface Detector of the Pierre Auger Observatory”
- 2015 – 2017 **Master’s degree in physics**, *RWTH Aachen University*, Germany.  
GP - 1.2, with distinction.
  - o Focus of study: particle physics, astrophysics
  - o 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.  
GP - 1.8, Thesis: “Charge Reconstruction of Heavy Ions in Monte Carlo Simulations of the AMS-02 Experiment”

## Experience

- 2020 – Today **Leader machine learning task**, *Pierre Auger Collaboration*.  
Coordination of the working group that investigates new data-driven methods and their application in astroparticle physics. Planning of machine learning workshops.
- Summer 2016 **Summer student at DESY**, *Hamburg, Germany*.  
Project: “The impacts of the muon spoiler background for the ILC detector performance”.

## Work Experience

- 2017 – Today **Research assistant**, *III. Physics Institute A, RWTH Aachen*.  
Lecturing, supervision of bachelor and master students, assistance in the organization of workshops.  
Research:
  - o Mass composition of ultra-high energy cosmic rays
  - o Application of machine learning algorithms in particle physics
  - o Acceleration of simulations using generative models
  - o Domain adaptation using adversarial frameworks
  - o Object reconstruction using deep learning

*Otto-Blumenthal-Str. 16 – 52075 Aachen*

📞 +49 241 80 27326 • ✉ [jonas.glombitza@rwth-aachen.de](mailto:jonas.glombitza@rwth-aachen.de)

🌐 [www.jonas-glombitza.com](http://www.jonas-glombitza.com)

1/4

2016 – 2017 **Students assistant, III. Physics Institute A, RWTH Aachen.**

- Experimental physics IV
- Astroparticle physics
- Physics for engineers

2015 – 2016 **Lab course assistant, I. Physics Institute B, RWTH Aachen.**

## Computer Skills

Coding Python, NumPy, TensorFlow, Keras, git, docker, C++ (basic)  
Office  $\LaTeX$ , Word, Excel, Powerpoint

## Teaching

2018 – Today **Deep Learning in Physics Research**, *master course, every summer term*, RWTH Aachen, 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

## Invited Talks and Lectures (selected)

- 2021 **2nd Terrascale School on Machine Learning**, *Hamburg, Germany*, lecture on Generative Adversarial Networks.
- 2021 **Physics seminar**, “*Generative Adversarial Networks for Physics Research*”, Linnaeus University, Sweden.
- 2018 **Big Data Science in Astroparticle Research**, *Aachen, Germany*, lecture on graph neural networks.
- 2019 **3rd inter-experimental machine learning workshop**, *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.

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2/4

- 2018 **Phenomenology Seminar**, *Heidelberg, Germany*, seminar: “Deep Learning in Physics Research”.
- 2018 **Big Data Science in Astroparticle Research**, *Aachen, Germany*, lecture on generative models.

## Conference Contributions

- 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*, talk: “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”.

## Books

- [1] 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)

- [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] 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.

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3/4

- [4] 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.
- [5] 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.
- [6] 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.
- [7] J. Glombitza for the Pierre Auger Collaboration, “Air-shower reconstruction at the Pierre Auger Observatory based on deep learning,” *PoS*, vol. 358, 2019.
- [8] L. Benato et al., “Shared data and algorithms for deep learning in fundamental physics,” 2021.
- [9] M. Erdmann and J. Glombitza, “Deep learning based algorithms in astroparticle physics,” *Journal of Physics: Conference Series*, vol. 1525, p. 012112, apr 2020.

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4/4