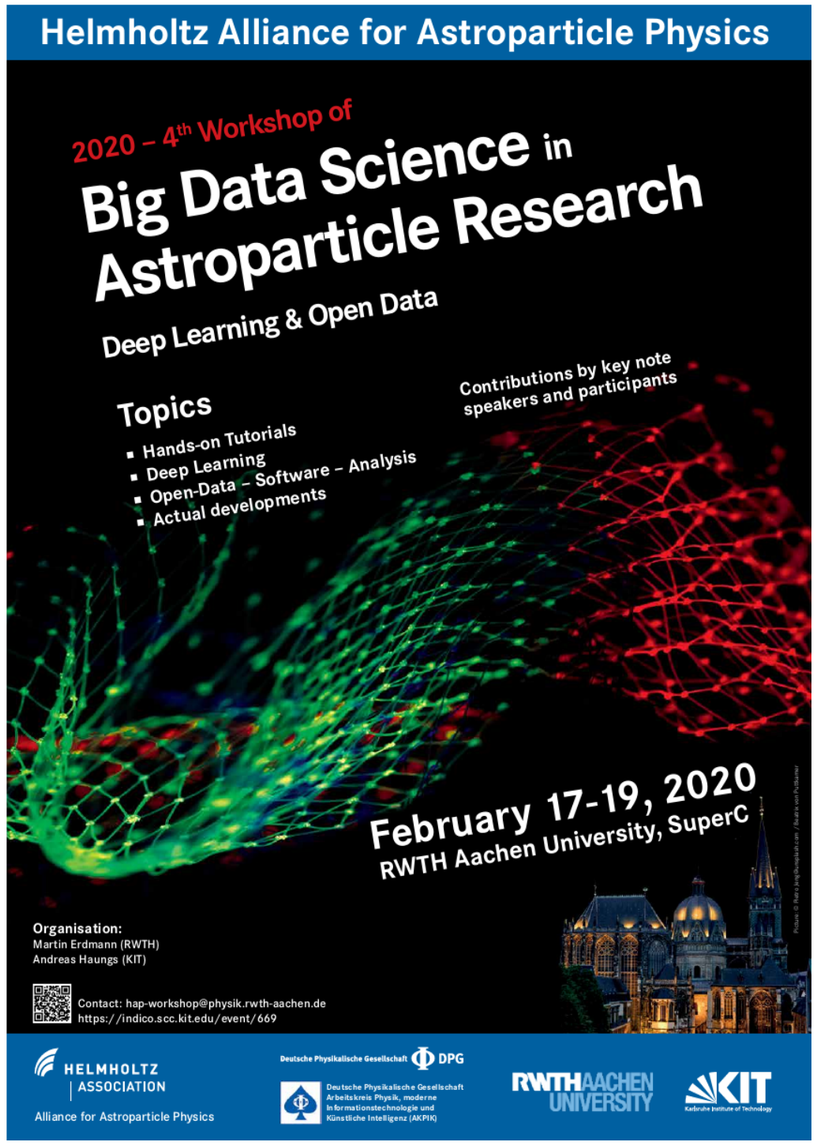
Welcome! Big Data Science in Astroparticle Research



Martin Erdmann, Andreas Haungs

WLAN access

Eduroam

Guests without Eduroam use `MOPS‘

Connect to WiFi network "RWTH-guests"

Login: BDSAR
Password: cjvefjgat

Coffee, eat

Yes, we‘ll have coffee breaks

17-Feb Dinner of your choice

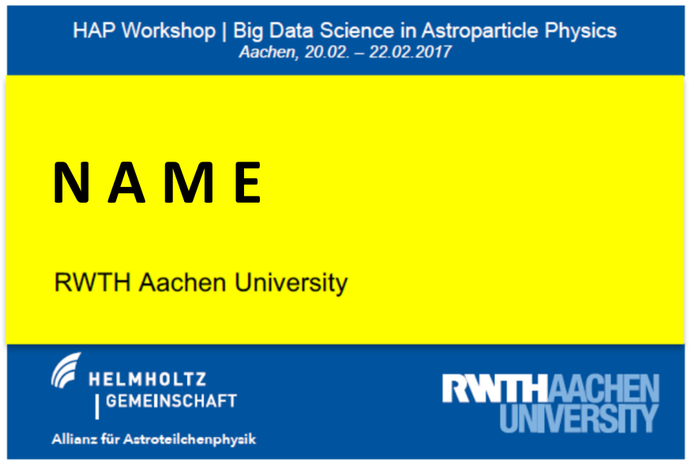
18-Feb Lunch of your choice

18-Feb Conference Dinner

Labyrinth, Pontstraße 156-158

Martin Erdmann, Andreas Haungs

Local organization



Workshop organizers: Martin Erdmann, Andreas Haungs, Teresa Bister, Peter Fackeldey, Jonas Glombitza

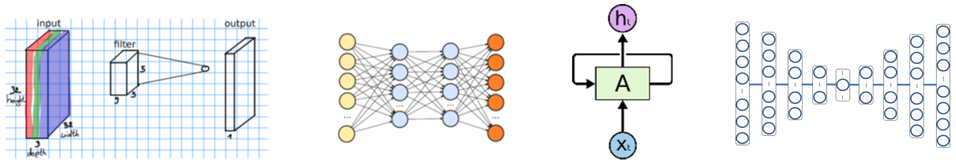
Reception desk: Sabine Bucher, Melanie Strothotte

VISPA for tutorial: Benjamin Fischer, Niclas Eich, Dennis Noll, Peter Fackeldey, and more

1st Workshop 20.-22. **Feb-2017**

Deep Learning

Network concepts & applications



Supervised machine learning

Tutorial: fully connected, convolutional

Open Data

Existing: The Virtual Observatory (Astronomy)

KCDC Kascade data preservation & publication

Future: Big data challenges in radio astronomy (SKA)

BMBF: Accelerating the Digital Transformation in Science → *message: do it!*

Evaluation

Discussion on future

Meet again in 1 year (today!)
Reputation of Software work
…

2nd Workshop 19.-21. **Feb-2018**

Deep Learning

- Supervised & unsupervised machine learning
- Causality & stability of networks
- Network training with simulations ≠ data

Tutorial: 14:15 basics & convolutional, 16:15 ***adversarial***

Open Data

Projects envisioned

- National initiatives: research data alliance, data center, application for funds
- International: initiatives in United Kingdom

Evaluation: Tuesday 16:00

Discussion on future: Wednesday

lots of discussions & initiatives happend in 2017

3rd Workshop 18.-20. **Feb-2019**

Deep Learning

- Deep learning publications from all astroparticle experiments!
- Mathematics & Informatics on machine learning

Tutorial: 14:15
Information Field Theory *16:15*
advanced IFT

vis-à-vis

Tutorial: 16:15 deep learning for beginners

Open Data

- Value of data: metadata, curation, combination
- nationale Forschungsdateninfrastruktur (NFDI)

  = national research federated infrastructure
- Digitization: Statement of the Universe &

  Matter Community to the BMBF

Evaluation: Tuesday 16:00

Discussion on future: Wednesday

(lots of discussions & initiatives in 2017/2018)

4th Workshop 17.-19. **Feb-2020**

Deep Learning

vis-à-vis

Tutorial: 14:15
Graph Networks

Tutorial: 14:15
deep learning for newcomers

Open Data

- ErUM-Data (research on Universe and Matter)
- Nationale Forschungsdateninfrastruktur (NFDI)

  = national research federated infrastructure
- Astrophysics, Astroparticle, Particle, Hadron &

  Nuclear Physics → Multimessenger

Evaluation: Tuesday 16:00

Discussion on future: Wednesday

Workshop Program

Monday	Welcome to Workshop	Martin Erdmann
	Tutorial on Graph-Networks, Tutorial deep learning newcomers	Jonas Glombitza, Peter Fackeldey
Tuesday	Welcome RWTH Aachen	Carsten Honerkamp
	ErUM-Data Report	Thomas Kuhr
	Applying Dynamic Graph CNN to reconstruct the direction of electrons in JUNO	Hauke Schmidt
	Identification of Cosmic Rays from Sources using Dynamic Graph Convolutional Neural Networks	Niklas Langner
	FPGA Belle II Trigger	Steffen Baehr
	FPGA Trigger of SuperCDMS	Hanno Meyer zu Theenhausen
	Xmax Reconstruction with AugerPrime using Deep Learning	Sonja Schröder
	Lowering the threshold of Tunka-Rex with autoencoder & toward Tunka-Rex Virtual Observatory	Dmitriy Kostunin
	Bayesian Networks, Invertable Networks	Tilman Plehn
	Exploitation of Symmetries and prior Knowledge in Deep Learning Architectures for IceCube	Mirco Hünnefeld
	Addressing domain adaptation issues with CRNNs and VERITAS data	Samuel Spencer
	Evaluation	
	Modern Machine Learning in Astronomie	Kai Polsterer
	Determining the distribution of interstellar gas with information field theory	Andrea Vittino
	Searching Pulsars Using Neural Networks	Lars Künkel
	The Astrophysical Multimessenger Observatory Network (AMON)	Miguel Mostafa
	Dinner	
Wednesday	Simulation of Extensive Air Showers with Deep Neural Networks	Marcel Köpke
	Physics motivated GAN for generating fourmomenta	Niclas Eich
	Open data and machine learning in German--Russian Data Life Cycle initiative	Victoria Tokareva
	The Astro@NFDI endeavour	Harry Enke
	Coffee	
	PAHN-PaN NFDI	Andreas Haungs
	Discussion	

Recommendation to *Speakers* from previous Workshop

- To take everyone even better, the first 90 seconds should be used to name the physical context (as everyone does), and then again 90 seconds to explain *why you wanted to use exactly this method*.
- Emphasize the methodical part (its a workshop) … by *showing code sniplets* (e.g. from Tensorflow), which is the crucial trick with which something worked.
- It's not a conference where you present each other's great transparencies, but a workshop where you can also *discuss the problem cases* where something didn't work and what prevents the others from spending time with the same mistakes.