

## AKBP 12: AI Topical Day – Invited Talks (joint session AKPIK/HK/ST/T/AKBP)

Time: Thursday 11:00–12:30

Location: HSZ/AUDI

**Invited Talk** AKBP 12.1 Thu 11:00 HSZ/AUDI  
**AI Techniques for Event Reconstruction** — •IVAN KISEL —  
 Goethe University, Frankfurt, Germany

Why can we relatively easily recognize the trajectory of a particle in a detector visually, and why does it become so difficult when it comes to developing a computer algorithm for the same task? Physicists and computer scientists have been puzzling over the answer to this question for more than 30 years, since the days of bubble chambers. And it seems that we are steadily approaching the answer in our attempts to develop and apply artificial neural networks both for finding particle trajectories and for physics analysis of events in general.

This talk will present the basics of artificial neural networks in a simple form, and provide illustrations of their successful application in event reconstruction in high energy physics and heavy ion physics experiments. You will get an insight into the application of traditional neural network models, such as deep neural network, convolutional neural network, graph neural network, as well as those standing a little aside from traditional approaches, but close in idea of elastic network and even cellular automata.

**Invited Talk** AKBP 12.2 Thu 11:30 HSZ/AUDI  
**Accelerator operation optimisation using machine learning** —  
 •PIERRE SCHNIZER — Helmholtz-Zentrum Berlin für Materialien und  
 Energie GmbH, Berlin, Germany

Accelerators are complex machines whose many components need to be accurately tuned to achieve design performance. Reliable operation requires frequent recalibration and tuning. Especially for large machines tools have been developed that facilitating this task.

Machine learning allows building such tools using simulations, archiver data or interaction with the real machine, thus making many tools now also available for smaller machines.

This talk will give an overview of different machine learning projects targeted to accelerators, which simplifies accelerator operation or even enable applications not been possible before.

**Invited Talk** AKBP 12.3 Thu 12:00 HSZ/AUDI  
**Is this even physics? – Progress on AI in particle physics** —  
 •GREGOR KASIECZKA — Universität Hamburg

Motivated by the large volume and high complexity of experimental data and mathematical structures, particle physics has a long tradition of employing state of the art computing and analysis techniques. Recent progress in machine learning and artificial intelligence have further pushed this trend, and these approaches are now ubiquitous in our field. This overview attempts to capture key developments such as the rise of unsupervised approaches and the quest for suitable neural network architectures for physics tasks; challenges like ultra-low latency inference and robust predictions; as well as promising new ideas looking forward.