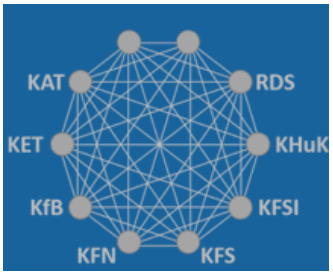

Contribution ID: **45** Type: **not specified**

Joint inference of calibration and signal

Wednesday 1 January 2025 11:10 (5 minutes)

Data collected by instruments are influenced by detector/system response, which has to be calibrated in order to reconstruct the underlying signal. The aim of the group is to jointly infer the detector/system response and the physical signal. Examples of the signal and the corresponding detector response include: reconstruction of the CR energy, direction and composition based on air shower properties (response: atmosphere condition, telescope efficiency) and identification of nuclei in mass spectra measured in heavy ion storage rings. The detectors/system can be calibrated using the data itself or with the help of additional calibration measurements (e.g., using sensors). A number of methods will be explored to tackle the problem of joint signal and calibration inference. This includes fundamental concepts of information field theory (IFT) and quantum field theory (QFT), in particular in view of tackling parametric degeneracies, as well as the usage of deep neural networks. The different approaches will be compared and combined.

List of Committees:

KAT, KHuK

Please describe your expertise/areas in which you would like to contribute / advise.

Data analysis and visualization.

Do you consent to the data usage and public abstract data posting in the ErUM-Data Community Information Exchange?

Yes

In ErUM-Data, what kind of data are you dealing with?

Experimental data: continuous stream sampled in time domain. to be processed later in frequency domain; pre-selected (event-based) signal samples with temporal and spatial information
Images of atmospheric showers, 3D + time neutrino events.

What is your expertise in computing and / or software development?

Advanced Python and C/C++ programming knowledge
Tensorflow, Pytorch

What is your field and role?

Please refer to individual abstracts of the co-authors.

Your ErUM - Committee is

More than one

Please describe areas in which you can contribute to “data handling”teaching.

Experience in large-scale facilities together with IT experts. Experience with GPU and basic experience with parallel computing farms (SLURM) and shared memory parallelization (OpenMP).

My current most burning research question, I like to find partners for, is:

How to implement joint inference of calibration parameters as well as the unknown physical signal from data.

Please describe areas in which you would like to improve your knowledge / skills.

Deep neural networks, preparation of data to be fed to the DNNs; Fusion of data/information within DNNs Representation of calibration data for DNNs or IFT: how the state of the instrument/system affects the signal, how these states can be parameterized and determined from data.

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