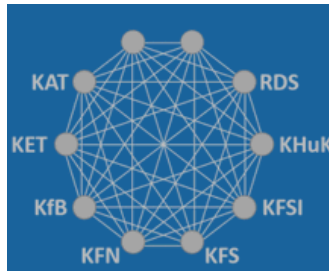


ErUM-Data Community Information Exchange



Contribution ID: 42

Type: **not specified**

Next generation v[f]ast data monitoring and control

Wednesday 1 January 2025 10:55 (5 minutes)

Today's and tomorrow's detector systems in the field of nuclear, hadron, particle, and accelerator physics are facing a growth in complexity due to the exploding number of sensor elements and the large amount and variety of information that is being generated. The next generation of experiments foresee to in-situ reconstruct the complete event topologies and to extract high-level (physics) information in an environment with unprecedented interaction rates and/or background sources. Considering the complexity of information and the limitations in scalability of existing data processing schemes, it is necessary to incorporate an intelligent monitoring system with automated sensor calibration to guarantee a stable running mode. Such a shift in paradigm can be realized by applying, on one hand, machine learning techniques optimized for anomaly detection and, on the other hand, a feedback system that couples back to the sensor parameters in the case of a detector-related problem or to initiate further processing of events with intriguing topologies. We propose to form a consortium that evaluates various machine learning techniques, including (un)supervised and reinforcement methods, to tackle this challenge within the broad field of accelerator-driven applications. This research will be guided by taking into account the interpretability of the system to provide sufficient understanding and confidence of its operation.

List of Committees:

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

Large-scale computing, multi-dimensional data analysis, statistics, physics interpretation

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?

Monte Carlo simulated data, beam data taken at accelerator facilities

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

various programming languages (Python, C++, Fortran), large-scale Monte Carlo simulations

What is your field and role?

Hadron (spectroscopy) and nuclear (few-body) physics, physics coordination in international collaborations, teaching (under)graduates

Your ErUM - Committee is

KHuK - Komitee für Hadronen- und Kernphysik

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

large-scale detection systems, statistical data analysis and interpretation

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

How to monitor and control data taken at upcoming large-scale experiments in the search of anomalies using data-driven machine learning methods?

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

Deep learning methodologies, anomaly detection techniques, and interpretability of networks

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