CDCS CENTER FOR DATA AND COMPUTING IN NATURAL SCIENCES

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## Predictive Maintenance for the Optical Synchronisation System at the European XFEL

The European XFEL is the largest currently operated linear particle accelerator in the world. It provides measurements requiring timing with an error margin in the femtosecond range for most subsystems within the facility. For this purpose, an optical synchronization system is installed at the European XFEL to stabilize critical accelerator components in time.

The main goal of the project is the development of a predictive maintenance module for the optical synchronization system installed at the accelerator. Especially, the high dimension of the data and differing update rates of the data are addressed by different data processing techniques. For reducing the high dimensionality of the data, dimensionality reduction (e.g. principal component analysis and autoencoder) and feature extraction techniques are used. Different machine learning techniques from the domain of clustering and anomaly detection are applied to the processed data for assigning anomaly scores.

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