AN IMPROVED DEEP AUTOENCODER METHOD WITH FEATURE CLUSTERING FOR ANALYZING LARGE DATASETS OF POWER QUALITY METRICS

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Ensuring adequate power quality metrics is a fundamental requirement for the reliable operation of power systems, particularly in the context of their digitalization, the decentralization of generation, the growing share of renewable energy sources, and the active development of power electronics. The widespread adoption of digital measurement and telemetry devices leads to the generation of large datasets of multidimensional time series, which complicates traditional approaches to analysis and requires intelligent data processing methods.

Thus, improving the deep autoencoder method with feature classification for the analysis of large datasets of electricity quality indicators is a pressing scientific challenge.

The aim of the report is to reducing the dimensionality of the input data to a compact vector of principal features while preserving information about the signal's characteristic variations.

The report reveals the an improved method for analyzing large datasets of power quality data is presented, which combines deep learning and cluster analysis. The method enables the formation of daily (or other fixed) sequences of indicators, converting them into a comparable form according to the selected time grid. It performs nonlinear data generalization into a compact feature space while minimizing reconstruction error, and also groups the resulting representations to reconstruct representative profiles for further physical interpretation and the construction of mode calendar maps.

The scalability of the method on multi-point data has been demonstrated: the method successfully analyzed measurements from 10 different points simultaneously, identifying synchronous patterns of increased harmonic distortion spanning the entire network.

A visualization of the results in the form of a map showing the distribution of patterns by day and facility is proposed, providing a convenient tool for systematic monitoring.

Список літератури

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