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Anomaly Detection in a Data Center with a Reconstruction Method Using a Multi-Autoencoders Model

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Abstract : Early detection of anomalies in data centers is important to reduce downtimes and the costs of periodic maintenance. However, there is little research on this topic and even fewer on the fusion of sensor data for the detection of abnormal events. The goal of this paper is to propose a method for anomaly detection in data centers by combining sensor data (temperature, humidity, power) and deep learning models. The model described in the paper uses one autoencoder per sensor to reconstruct the inputs. The auto-encoders contain Long-Short Term Memory (LSTM) layers and are trained using the normal samples of the relevant sensors selected by correlation analysis. The difference signal between the input and its reconstruction is then used to classify the samples using feature extraction and a random forest classifier. The data measured by the sensors of a data center between January 2019 and May 2020 are used to train the model, while the data between June 2020 and May 2021 are used to assess it. Performances of the model are assessed a posteriori through F1-score by comparing detected anomalies with the data center's history. The proposed model outperforms the state-of-the-art reconstruction method, which uses only one autoencoder taking multivariate sequences and detects an anomaly with a threshold on the reconstruction error, with an F1-score of 83.60% compared to 24.16%.

Keywords : anomaly detection, autoencoder, data centers, deep learning
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