Process Fault Detection using Autoencoder via Adaptive Learning with VariationalAutoencoder

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Recently, a process monitoring method using autoencoder which is a machine learning technique effective in dimensionality reduction, has been proposed. Machine learning techniques, on the other hand, are based on vast amounts of training data. However, it is not easy to have enough training data with high quality to meet the needs in the model construction. Therefore, we propose a methodology that can guarantee the performance of the machine learning-based monitoring model by combining a generative model to supplement data insufficiency by artificial data with the autoencoder monitoring models. The structure of the autoencoder is determined by the scale and nonlinearity of the process, and the variational autoencoder, which is named in that it has a similar structure to autoencoder in the learning phase, will be used as the generative model in the proposed method. We propose a structure that can improve the monitoring performance by adjusting the configuration of autoencoder for process monitoring, and train the generative model to be suitable for generation. In order to verify the performance of the proposed methodology, we performed a case study on the Tennessee Eastman Process.