SensorSCAN: Self-supervised learning and deep clustering for fault diagnosis in chemical processes (Abstract Reprint)

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Abstract

Modern industrial facilities generate large volumes of raw sensor data during the production process. This data is used to monitor and control the processes and can be analyzed to detect and predict process abnormalities. Typically, the data has to be annotated by experts in order to be used in predictive modeling. However, manual annotation of large amounts of data can be difficult in industrial settings.

In this paper, we propose SensorSCAN, a novel method for unsupervised fault detection and diagnosis, designed for industrial chemical process monitoring. We demonstrate our model's performance on two publicly available datasets of the Tennessee Eastman Process with various faults. The results show that our method significantly outperforms existing approaches (+0.2-0.3 TPR for a fixed FPR) and effectively detects most of the process faults without expert annotation. Moreover, we show that the model fine-tuned on a small fraction of labeled data nearly reaches the performance of a SOTA model trained on the full dataset. We also demonstrate that our method is suitable for real-world applications where the number of faults is not known in advance. The code is available at https://github.com/AIRI-Institute/sensorscan.

References

[Golyadkin *et al.*, 2023] Maksim Golyadkin, Vitaliy Pozdnyakov, Leonid Zhukov, and Ilya Makarov. Sensorscan: Self-supervised learning and deep clustering for fault diagnosis in chemical processes. *Artificial Intelligence*, 324:104012, 2023.