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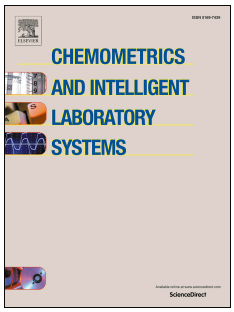

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Representation Learning based Adaptive Multimode Process Monitoring

Feiya Lv[a], Chenglin Wen[b*], Meiqin Liu[a]

***Abstract*—**This paper focus on developing representations that are formed by the composition of multiple non-linear transformations, with the goal of yielding more abstract and ultimately more useful representations in multimode process monitoring. To enhance the sensitivity of the learned higher-order correlations, an adaptive thresholding scheme is developed. Thus a representation learning based adaptive monitoring method is proposed in this paper. A geometry interpretation of AE net is presented to explore its expressive powers. Moreover, the proposed framework can do real-time mode identification and fault detection online collectively under a global model than describing variations in each isolated mode separately. Experiment results show that the proposed method not only improves the divisibility between multimodes, but also exhibits superior performance of fault detection on an industrial benchmark of chemical process, Tennessee Eastman process (TEP).

***Index Terms*—**adaptive threshold, fault detection, global model, mode identification, representation learning

1. Introduction

For large scale production systems, the emergence of system abnormalities may lead to production loss, damage of operation units, and even collateral human casualties. Aiming at real-time identification of the presence of abnormal operating conditions, online monitoring techniques are required. Multivariate statistical process control (MSPC) has been an active research field during the past several decades. It analyzes the underlying correlations between mode measurements and detects faults by monitoring whether the process moves outside the desired normal operating region. The efficiency of MSPC methods can be seen in various industrial

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