

## Process Monitoring and Fault Isolation using Probabilistic Graphical Model and Graphical Lasso

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Since process faults cause tremendous losses, it is essential to detect and isolate faults early. PCA, a conventional monitoring method, and alternatives to improve its limitations have been proposed, but there's no outstanding result. Recently, machine learning, which are one of the probabilistic graphical models, have been applied in various fields and achieved great outcome. So, in this study, a new monitoring methodology that combines 'Markov Random Fields(MRFs)' which is a kind of probability graphical model and 'Graphical Lasso' which is regularization method.

MRFs can represent complex relationship between process variables as a graphical model and improve monitoring performance based on joint probability considering related variables simultaneously. Additionally, applying graphical lasso, a regularization method that induces sparse precision matrix, can reduce computational complexity and redundancy and improve performance by dividing the entire graph into smaller sub-graphs. Conventional monitoring methods and proposed method were tested with 28 faults of Tennessee Eastman process. The proposed method showed better results even in undetectable cases before.