

Machine Learning and Data Analytics meets Process Control

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The last several decades have witnessed such floods of data generated in process manufacturing industries. The optimization-based controllers like Model Predictive Control could be computational demanding if dealing with a large number of states and uncertainties. Hence, capturing the most important information and the internal relationship hidden in the huge amount of data has become the key challenge in decision-making under uncertainty. The inner-correlation between the data are however not always known as a prior. Machine learning (ML) method therefore becomes a promising data-driven approach due to its capability of capturing the feature of data.

In this project, machine learning techniques are first adopted for uncertainty data analytics in process control. Specifically, if the control objective is to manage the room temperature of a building, the uncertainty might be the prediction error in the external/ambient temperature, which will influence the room temperature because of the heat transfer. After the information is extracted from the historical and real-time data, a stochastic programming or robust optimization model can be developed and solved to optimize the operation decisions, i.e., the power or energy consumption of the radiators in the building. The results need to be analyzed with comparative studies to demonstrate the benefits of data-driven optimization.

