Faculty of Engineering and Applied Science
Chemical Engineering Seminar Series

Incorporating process knowledge into data-driven models

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Dupuis Hall, Room 217

Machine learning has received tremendous interest in the recent past in the hope that it can leverage larger amounts (and different types) of historical process data, along with improved computational resources and algorithms to offer better solutions for the modeling, monitoring, control and optimization of chemical processes. However, the premise that 'big data' is available is not always met in process systems. Many process systems have hard to measure quality variables, or are not heavily instrumented, which leads either to some variables being measured infrequently or not at all, or a low overall sampling rate for the system. In such situations, it becomes important to leverage any process knowledge and offline sources of data or information in building process models. Another advantage of the incorporation of process knowledge into data-driven models is the potential to improve the interpretability/explainability of the model, which can provide more assurance about its capabilities.

(See slide 2)

In this talk, I will attempt to lay out the paradigms through which process knowledge can be incorporated into data-driven modeling frameworks, and will provide examples from my group’s research of various situations with different amounts of process knowledge ranging from none to having detailed physical models in which data-driven models can be deployed effectively. These range from complex reacting systems to mineral processing systems to carbon capture systems to petroleum reservoirs, and the models are developed in the service of process systems engineering objectives ranging from monitoring to advanced control to optimization.