

Physics/Knowledge-Informed Learning in Process Data Analytics

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With the growing complexity of modern industrial processes and the arrival of the big data era, large-scale plant-wide processes have drawn increasing research attentions in the field of process modeling and analysis. Complex process data poses great challenges not only to information capture, data management and storage, but also, more importantly, to efficient interpretation of the information hidden within those

data. To accelerate process design without sacrificing product quality and production cost, data-driven techniques for process analysis and control become very important for the breakthrough of the bottleneck.

In-depth analysis of process data collected from the entire plant provides insights for decision makers to maintain healthy operation of the plant. One important research topic is the integration of process data analytics, process physics/knowledge, and/or operator experiences, where machine learning, including deep learning, techniques play an important role. In doing this, the efficiency and safety of process operation can be improved, the energy can be saved, the profitability can be increased, and hence the competitiveness of the industrial companies can be enhanced.

The purpose of this invited session is to call attentions to this research topic and invite the experts in the related fields to discuss the recent developments and future perspectives. In this invited session, the up-to-date research directions and physics/knowledge-informed machine learning (including deep learning) methods for process data analytics will be overviewed. We want to gather active researchers in the related areas in a same room and discuss their most recent research on both theories and applications. Following is a partial list of research areas that will be involved to this special session:

- Physics/knowledge-informed learning methods for modeling of process data
- Machine learning, including but not limited to deep neural networks, transfer learning, and generative learning methods, for process data analytics
- Advanced soft-sensor and process monitoring technologies
- Industrial applications of the state-of-the-art machine learning techniques
- Tools for collecting, visualization, or analyzing process data