The inaugural conference on the **Foundations of Process Analytics and Machine Learning** (**FOPAM 2019**) was held at the StateView Hotel, Raleigh, North Carolina on August 6–9, 2019. This conference serves as a forum for researchers from industry and academia to discuss the current status and future directions of data analytics and machine learning in the process industries. A total of 120 attendees participated in the conference, with roughly 1/3 from industry. Topics included

- Computational chemistry/materials analytics (including machine learning for molecular design)
- Machine learning for process and control design
- Data analytics and high-throughput data processing for process monitoring, estimation, and diagnosis
- Reinforcement learning and deep reinforcement learning for process operations and control
- Synergies between process, materials, business, and supply-chain data analytics
- Data analytics education for chemical engineers

The conference was preceded by a 1.5-day workshop on process data analytics and machine learning by S. Joe Qin, Leo H. Chiang, and Richard D. Braatz. Workshop topics include unsupervised, supervised, and partially supervised learning; sparse and dense models; latent variable methods; support vector machines; kernel methods; neural networks; deep learning; industrial tips and tricks of the trade, and industrial case studies.

The program included 12 invited talks:

- Keith Collins (SAS), AI Recipe to Navigate the Art of the Possible
- Alán Aspuru-Guzik (University of Toronto), Materials for Tomorrow, Today
- Paulette Clancy (Johns Hopkins University), Use of Bayesian Optimization Approaches to Locate Polymorphs in Organic Electronic Materials
- Connor W. Coley (MIT), Leveraging Historical Reaction Data to Inform Synthesis and Synthesis Design
- Concepción Jiménez-González (GlaxoSmithKline), Data Analytics in Sustainable Pharma Process Design and Operations
- Leo H. Chiang (Dow Chemical), Current Practice and Future Directions in Industrial Process Monitoring
- S. Joe Qin (University of Southern California), Statistical Learning of Dynamic Latent Variables for Monitoring and Predictive Analytics
- Jay H. Lee (KAIST), Reinforcement Learning – Overview and Potential for Process Systems Engineering Field
- Melanie Zeilinger (ETH Zurich), Learning-based Control with Constraints
- Marina Kovach (IBM), Analytics in Healthcare and Life Sciences
- Warren B. Powell (Princeton University), A Unified Framework for Sequential Decision Analytics in Energy Systems
- Michael Rappa (North Carolina State University), Behold the Data Scientist!

An exciting program of invited talks brought in relevant expertise from outside of the process industries while also spanning all of its main products, including chemicals, energy, and pharmaceuticals. Invited talks were followed by more in-depth panel discussions with the speakers and other leaders in process data analytics and machine learning. Networking and discussions were further facilitated by a hospitality suite that was held each night with drinks and snacks.

More than 50 contributed posters were presented in Wednesday and Thursday afternoon sessions. These sessions were a very important component of the conference, allowing the community to gather to discuss

the latest advances being made around the world in process data analytics and machine learning and related topics while networking over drinks and snacks.

On Friday afternoon was a special session on educating students and colleagues. The session included a description of an M.S. degree program in data analytics and a sampling of process data analytics and machine learning education in several undergraduate and graduate chemical engineering programs. A panel discussion surveyed undergraduate and graduate curricula in chemical engineering departments, and a lively debate discussed how to best include such topics into curricula while competing with other topics important to chemical engineering education such as process dynamics and control.

The conference concluded on Friday night with a conference banquet, where rapporteurs Phillip Westmoreland and Martha Grover reported on the proceedings of the meeting, including some observations and highlights.

We thank the advisory committee, session chairs, speakers, panelists, poster presenters, and other participants for making FOPAM successful. Ms. Robin Craven deserves special recognition for organizing the conference efficiently, and we thank the StateView Hotel–Marriott Autograph Collection for working closely with Robin on the conference logistics. We thank the CACHE Corporation for their encouragement and sponsorship of the conference.

We also would like to thank our conference sponsors: AIChE, its Computing and Systems Technology Division and Computational Molecular Science and Engineering Forum, AspenTech, Dow Chemical, Eastman Chemical, ExxonMobil, and OSIsoft. We also gratefully acknowledge the National Science Foundation, which has awarded funds for registrations of 25 junior faculty, postdoctoral associates, and graduate students. Without this support, many of the conference activities would not have been possible.

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