Hybrid Digital Twin for monitoring and tuning gas treatment unit

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Abstract

The proposed paper concentrates on an innovative solution to integrate machine learning and artificial intelligence capabilities into a digital twin calibration campaign.

The concept of digital twin is now well understood in the context of Industry 4.0. Its strategy is based on predictive models as they provide the key information to monitor and operate physical assets for maximum efficiency.

However, 'predictive models' can have very different origins and quality, and there is usually no single model required to build the right Digital Twin. Models can emerge from data using machine learning and artificial intelligence or based on physical laws and simulation. The challenge is then to build, combine and deploy all these models at scale into suitable Hybrid Digital Twin.

The suggested process allows to interact in real time with a gas production unit. The goal of monitoring such unit is to detect anomalies, optimize the production, reduce the energy consumption, and have control on the maintenance.

To introduce rapid recommendations, typically for control optimization, the predictive model replaces the simulation one. It speeds up the generation of results when the waiting time is critical while keeping a sufficient accuracy.

We will show how the Hybrid Digital Twin is assembled and how it interacts with the physical asset, from data collection and streaming with the IoT, to the feedback loop and operator support with the dashboard.

This project illustrates different scenarios ranging from simple asset monitoring to more complex asset tuning and optimisation under changing operating conditions.

Key words: machine learning, digital twin, surrogate model, automatization.

About the speaker:
Nina Moëllo has an Aircraft Design and System Engineering background. She has a master's degree in aerospace engineering and took part on research activities within renowned laboratories in the aeronautical environment, in France and Canada. She focused on multidisciplinary optimization applied for airplane design, conceptual design of electrical aircraft and aerodynamic optimization of UAVs. She now works at Datadvance in France as application engineer. Datadvance is a former spin-off of Airbus research group and now independent international software company. The company is specialized in collaborative Cloud platform for simulation & Data Analytics workflow automation.