Towards Automatic Batch Phase Recognition for the Process Industry

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The sophisticated use of available data is of growing importance in digital manufacturing strategies. This includes past values of process measurements and actuation which, as entities within the regulatory control system, are almost always archived automatically. These time series data contain unperturbed information about the state of production processes. Their use ranges from honest evaluation of asset performance by means of data analytics to data-driven or hybrid modelling for the sake of quality or machine failure predictions.
In batch plants, advanced methods require information about batch phases (phase-sensitive/multi-stage methods) in order to achieve the best results. Availability and precision of these data may be limited compared to the aforementioned time series, especially in semi-automated or remote small-scale plants with limited Supervisory Control and Data Acquisition (SCADA) compliance.

This article examines different approaches to detect batch phases automatically using machine learning methods which exploit patterns in time series data. The work borrows the structure of the machine learning lifecycle in order to assign a familiar structure to noteworthy results. These include the definitions of industrially relevant use cases, a deep dive into real plant data, the generation of additional datasets using a benchmark model, as well as the application of first machine learning methods. Our activities are part of the public funded research project KEEN, which has the objective to introduce artificial intelligence technologies and methods in the process industry and to evaluate and to implement them. As such we highlight gained insights from the collaboration between the partners from industry and academia and illustrate how the general principles established in KEEN are successfully applied to a tangible use case in the process industry.