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Local batch time prediction based on the mixture of local batch experts: a case study on a polymerization process

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Some batch processes have a large variability on the batch-to-batch time completion caused by process conditions and/or external factors. The local batch time is commonly inferred from process experts. However, this may lead to inaccuracies, due the uncertainty associated with the batch-to-batch variations, leading the process to run more than is really needed. Process engineers could appeal to statistical process monitoring and control mechanisms to help on the estimation of the batch time completion. However, the existing tools for batch prediction relies on dynamic time warping, which are not straightforward to implement and are not suitable for real time applications. To solve this issue, this work presents a new framework for batch time prediction in real time. For that, a local batch time model is build for each batch separately, and integrated into the mixture of experts framework. On real time data, when a new sample becomes available, the framework detects the similarity of the current batch sample with respect to the historical batch data. The remaining batch time is estimated by weighting the local batch time models. This approach has been evaluated on a polymerization benchmark data-set and has show promising results. The results shows that the mixture of local batch expert has a good ability to predict the remaining batch time, without the need of any data alignment. Thus, simplifying the process of build process monitoring control tools for the remaining batch time prediction;

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