Improving Long Range Predictions in Nonlinear Process Modelling through Bayesian Combination of Multiple Neural Networks

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Abstract
This paper presents a Bayesian combination scheme for combining multiple neural networks. Instead of using fixed combination weights, the estimated probability of a particular network being the true model under a given process operating condition is used as the combination weight for combining that network. A nearest neighbour method is used in estimating the network error for a given input data point, which is then used in estimating the probability of the network being the true model. The prior probability is estimated using the sum of squared errors of individual networks on a sliding window covering the most recent sampled data instead of using the previous posterior probability as a prior for prediction at the next sampling time. The proposed method is applied to the modelling of a nonlinear processes and it is shown that the proposed method can improve model robustness.

Keywords: Advance Process Control, Multiple Neural Networks, Bayesian Combination of Neural Networks, Nonlinear Process Modelling.