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Subsampled support vector regression ensemble for short term electric load forecasting

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Abstract

Accurate prediction of short-term electric load is critical for power system planning and operation. However, integration of the point estimation into the power system is constrained by its uncertainty nature and low interpretability for confidence level. For this propose, this study derives and tests methods to model and forecast short term load point estimation and its confidence interval length by using Subsampled support vector regression ensemble (SSVRE). To improve the computational accuracy and efficiency, a subsampling strategy is designed for the programming implementation of the support vector regression (SVR) learning process. This subsampling strategy ensures that each individual SVR ensemble has enough diversity. Then, for model selection, we present a novel swarm optimization learning based on all the individual SVR ensembles. The advantage of swarm coordination learning is that we can ensure that each individual SVR ensemble has enough strength for forecasting the short term load data. Theoretically, the latest research shows that formal statistical inference procedures can be determined for small size subsamples based ensemble. In practice, a subset of small size subsamples is employed for the speeding-up of SVR learning process. Accordingly, the results indicate the better performance and lower uncertainty of SSVRE model in forecasting short term electric load.

Keywords: Electric load forecasting, Subsampling, Support vector regression, Ensemble, Prediction confidence level

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