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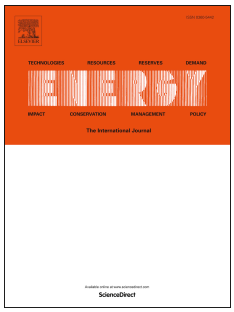

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Parallel and Reliable Probabilistic Load Forecasting via Quantile Regression Forest and Quantile Determination

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Abstract

With the rapidly increasing complexity of operational challenges in smart grid environment, the traditional load point forecasting methods are no longer adequate. Probabilistic load forecasting has been proven to be more suitable in these environments due to their superior ability to provide more advanced uncertainty quantification. Most of the probabilistic forecasting methods, however are either insufficiently accurate or take very long training time. While probabilistic forecasting using quantile forecasts has been popular in research, the industry has been adopting another form of probabilistic forecasts, namely prediction intervals (PIs). The direct PI construction (DPIC) method typically employed for deciding the corresponding upper and lower quantile pair in PIs, however cannot guarantee the reliability of constructed PIs. This paper not only proposes a parallel and improved load quantile forecasting method but also solves the reliability issue of DPIC by proposing an alternative quantile determination (QD) method. Case studies show that the proposed load quantile forecasting method is both more accurate and more computationally efficient than the state-of-the-art methods and the reliability issue of DPIC is considerably alleviated by QD.

Keywords: Probabilistic forecasting, Quantile regression forest, Gradient

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