Recurrent Neural Network Based Short-Term Load Forecast with Spline Bases and Real-Time Adaptation

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摘要

Short-term load forecast (STLF) plays an important role in power system operations. This study proposes a spline bases-assisted Recurrent Neural Network (RNN) for STLF with a semi-parametric model being adopted to determine the suitable spline bases for constructing the RNN model. To reduce the exposure to real-time uncertainties, interpolation is achieved by an adapted mean adjustment and exponentially weighted moving average (EWMA) scheme for finer time interval forecast adjustment. To circumvent the effects of forecasted apparent temperature bias, the forecasted temperatures issued by the weather bureau are adjusted using the average of the forecast errors over the preceding 28 days. The proposed RNN model is trained using 15-min interval load data from the Taiwan Power Company (TPC) and has been used by system operators since 2019. Forecast results show that the spline bases-assisted RNN-STLF method accurately predicts the short-term variations in power demand over the studied time period. The proposed real-time short-term load calibration scheme can help accommodate unexpected changes in load patterns and shows great potential for real-time applications.