Short-Term Hourly Load Forecasting Using Abductive Networks

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Summary

Short-term load modeling and forecasting are essential for operating power utilities profitably and securely. Modern machine learning approaches, such as neural networks, have been used for this purpose. This paper proposes using the alternative technique of abductive networks, which offers the advantages of simplified and more automated model synthesis and analytical input-output models that automatically select influential inputs, provide better insight and explanations, and allow comparison with statistical and empirical models. Using hourly temperature and load data for five years, 24 dedicated models for forecasting next-day hourly loads have been developed. Evaluated on data for the sixth year, the models give an overall mean absolute percentage error (MAPE) of 2.67%. Next-hour models utilizing available load data up to the forecasting hour give a MAPE of 1.14%, outperforming neural network models for the same utility data. Two methods of accounting for the load growth trend achieve comparable performance. Effects of varying model complexity are investigated and proposals made for further improving forecasting performance.