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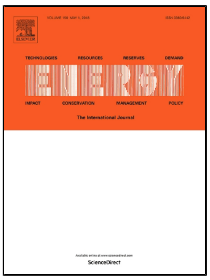

Effective sparse adaboost method with ESN and FOA for industrial electricity consumption forecasting in China

Lin Wang, Shengxiang Lv, Yu-Rong Zeng

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Effective sparse adaboost method with ESN and FOA for industrial electricity consumption forecasting in China

Lin Wang[a], Shengxiang Lv[a], Yu-Rong Zeng*[b, a]
[a] School of Management, Huazhong University of Science and Technology, Wuhan 430074, China
[b] School of Information Engineering, Hubei University of Economics, Wuhan 430205, China

Abstract: Accurate electricity consumption forecasting is a challenging task for its unstable behavior and influence mechanism based on multiple factors. In this study, a neural network ensemble approach is designed to solve this problem. In the proposed method, a novel sparse adaboost (adaboost$_{sp}$) is designed as the ensemble framework to enhance the generalization ability and reduce ensemble cost, and echo state network (ESN) is adopted to build the nonlinear relationships between electricity demand and multiple factors. An improved fruit fly optimization algorithm (FOA) helps selecting input variables considering their time lag effects. Two industrial electricity consumption (IEC) forecasting applications in China are investigated to verify the effectiveness of proposed ensemble forecasting approach. Numerical results indicate that adaboost$_{sp}$-ESN with FOA can better predict the future IEC than various benchmark methods. Compared with existing boosting ensemble approaches, the proposed adaboost$_{sp}$ is more efficient and can save considerable computation cost. Impacts of selected variables are further examined and results show many industrial indexes have significant time lag effects on IEC. Based on the proposed techniques, future IEC demand in Hubei Province is estimated and analyzed. Application studies demonstrate the proposed hybrid ensemble approach is a practical choice for mid-term IEC adjustment and projection.

Keywords: Sparse adaboost; echo state network; fruit fly optimization algorithm; ensemble forecasting; industrial electricity consumption forecasting.

*Corresponding author.
E-mail addresses: wanglin982@gmail.com (Lin Wang);
shengxianglv@foxmail.com (Shengxiang LV);
zyrhbue@gmail.com (Yurong Zeng).