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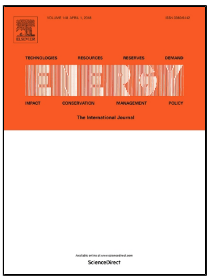

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Effective electricity energy consumption forecasting using echo state network improved by differential evolution algorithm

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Abstract: Electricity energy consumption (EEC) has great effect on the government to make reasonable energy policy and has attracted great attentions of the power generation groups with the liberalization of competition in the electricity industry. In fact, the EEC is easily affected by many factors, including the climate factor and the gross domestic product. So, the precise forecasting of electricity energy consumption is very challenging. This study aims to propose an effective and stable model named ESN-DE using an improved echo state network for forecasting electricity energy consumption. Differential evolution algorithm is used to search optimal values of the three crucial parameters of echo state network. Two comparative examples and an extended example are used to validate the applicability and accuracy of the proposed ESN-DE. Errors of the comparative examples where mean absolute percentage errors of ESN-DE are 1.516% and 0.570% respectively indicate that the ESN-DE outperforms the traditional echo state network and the existing best model. Mean absolute percentage error of ESN-DE is 2.156% for Zhengzhou City's electricity energy consumption forecasting. The proposed ESN-DE is a potential candidate for effective forecasting of electricity energy consumption because of its easy implementation and stability.

Keywords: Electricity energy consumption forecasting, echo state network, differential evolution algorithm

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