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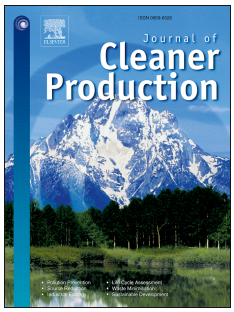

Short-term wind power prediction based on data mining technology and improved support vector machine method: A case study in Northwest China

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Short-Term wind power prediction based on data mining technology and improved support vector machine method: A case study in Northwest China

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Abstract: In recent years, wind power industry has been developing rapidly as the wind resources are clean, cheap and inexhaustible. However, it is difficult to supply steady wind power generation due to the strong randomness, volatility and uncontrollability of wind energy. Therefore, it is significant to propose an efficient wind power prediction model. In this paper, a short-term wind power prediction model is proposed based on data mining technology and improved support vector machine method. In this model, data mining is employed to investigate the relationship between wind speed and wind power output and then modify the invalid original data. Then, based on wavelet transform method, the high frequency parts of the original signal can be eliminated. Next, cuckoo search algorithm is used to optimize kernel function and penalty factor of support vector machine in order to improve the accuracy of the forecast result. Finally, a wind farm located in the Northwest China is selected to perform the case study. The results indicate that the proposed model has the best performance according to the values of several error assessment indexes, including mean absolute error, mean squared error and mean absolute percentage error.

Keywords: Data mining; wavelet transform; support vector machine; wind power prediction; cuckoo search

1. Introduction

Recently, China is facing serious energy and environmental problems. On the one hand, with the development of China's economy, the demand for energy is growing rapidly and the primary energy is gradually drying up globally. On the other hand, fossil fuels have caused serious environmental pollution problems. China's carbon dioxide emissions have surpassed that of the United States, ranking the first in the world(Boden et al., 2017). Therefore, it is imperative to adjust the energy structure by using renewable energy. Wind energy, which is clean and renewable, has attracted wide attention all over the world. After decades of development, wind power has become the most promising energy with mature technology and low development cost. In recent years, China has witnessed a large-scale growth in installed wind power capacity and generation (Wu et al., 2018). Data from the Chinese Wind Energy Association (CWEA) shows that China's wind power generation capacity in December 2016 reaches 20 billion kWh with a 29.3% increase from last year and the total amount of 2016 is 206.68 billion kWh with a year-on-year growth of more than 27%. The statistics are showed in Fig 1. The accurate prediction of