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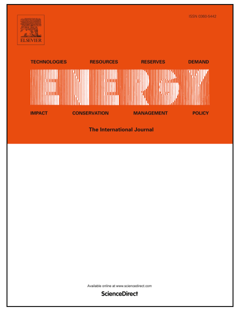

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Water source heat pump energy demand prognosticate using disparate data-mining based approaches

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Abstract

This paper examines the data-mining and supervised based machine learning models for predicting 1-month ahead cooling load demand of an office building, including the primitive intention of enhancing the forecasting performance and the accuracy. The data-mining and supervised based machine learning models include; regression support vector machine, Gaussian process regression, scaled conjugate gradient, tree bagger, boosted tree, bagged tree, neural network, multiple linear regression and bayesian regularization. The external climate data, hours/day in a week, previous week load, previous day load and previous 24-hour average load are applied as input parameters for these models. Whereas, the output of the models is the electrical power required for water source heat pump. A water source heat pump located in Beijing, China, is selected for examining 1-month ahead cooling load forecasting, i.e., from July 8 to August 7, 2016. In this paper, simulations are classified into three sessions: 7-days, 14-days and 1-month. The forecast performance is assessed by computing four performance indices such as mean square error, mean absolute error, root mean square error and mean absolute percentage error. The mean absolute percentage error for 7-days ahead cooling load prediction of the water source heat pump from data-mining based models, Gaussian process regression, tree bagger, boosted tree, bagged tree and multiple linear regression were 0.405%, 3.544%, 1.928%, 1.703% and 13.053% respectively. While, mean absolute percentage error of 7-days ahead forecasting in case of machine learning based models such as a regression support vector machine, Bayesian regularization, scaled conjugate gradient and neural network were 12.761%, 2.314%, 6.314%, 2.592% respectively. The percentage forecasting error index proved that the results of data-mining based models are more precise and similar to the existing machine learning models. The results also demonstrate that the better performance and efficiency in foreseeing the abnormal behavior in forecasting and future cooling load demand in the building environment.