Predicting Passenger Train Delays Using Neural Network

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Abstract

One of the major issues in railways is passenger train delays and this matter in railway has many reasons; so predicting passenger train delay is a very difficult task. The aim of this paper is to present an artificial neural network based model with high accuracy to predict the delay of passenger trains in the Iranian Railways. In the proposed model, we use three different methods to define inputs including normalized real number, binary coding, and binary set encoding inputs. One of great challenge for using neural network is how to design a superior network for a specific task. To find an appropriate architecture for the proposed neural network model, three different strategies, called quick, dynamic, and multiple are investigated. In this research, the registered data of passenger train delays in Iranian Railways from 2005 to the end of 2009 year is used. To eliminate any inconsistent and noisy data, which always companion with real world data set, a comprehensive preprocessing on this data set is done. To prevent the proposed model from over fitting with data specifications, according to cross validation, we divide existing passenger train delays data set into three subsets called training set, validation set, and testing set. To evaluate the proposed model, we compare the result of three different data input methods and three different architectures with each other and with some common prediction methods such as decision tree and multinomial logistic regression. In comparison different neural networks, we consider training time, accuracy of neural network on testing data set and network size and to compare neural networks with other well-known prediction methods we consider training time and the accuracy of neural network on testing data set. To do a fair comparison among all models we sketch a time-accuracy graph. The results revealed that the proposed model has higher accuracy.

Keywords

Neural network, Prediction model, Passenger train delays, Iranian Railways