Efficiency Analysis of Artificial Neural Networks and Multiple Linear Regression Methods for Tides Prediction

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Abstract

Prediction of tides has been received a great attention from decades ago since its importance in admiralship, navigation, port designing and other related issues. The goal of this paper is to investigate the efficiency of predictive models based on Multiple Liner Regression (MLR) and feed-froward Artidicial Neural Networks (ANNs) using 3 learning algorithms of Gradient Descent (GD), Conjugate Gradient (CG) and Levenberg-Marquardt (LM). For this purpose, hourly observed data of Chabahar bay station in the Gulf of Oman and Kish Island and Imam-Khomeini port stations in the Persian Gulf were used. In the current study, the partial auto-correlation was used to determine the appropriate lag of input data. The results of models according to the criteria of RMSE and MAPE indicated that the ANN-LM has the highest accuracy in predicting tides in the 3 stations. This algorithm improved the prediction accuracy about 22%, 4% and 2% compared to MLR, GD and CG models. Finally, the residual analysis revealed the over-predictive behavior of ANNs in Kish Island and Imam Port stations while their under-predictive tendency in Chabahar Bay.