

Forecasting River Water Levels in the Bac Hung Hai Irrigation System of Vietnam Using an Artificial Neural Network Model

Hung Viet Ho¹ (Hồ Việt Hùng)

¹Faculty of Water Resources Engineering, Thuyloi University, 175 Tay Son, Dong Da, Hanoi, Vietnam

Corresponding Author: hohung.thuyluc@tlu.edu.vn

.....

Abstract

There is currently a high-accuracy modern forecasting method that uses machine learning algorithms or artificial neural network models to forecast river water levels or flowrate. As a result, this study aims to develop a mathematical model based on artificial neural networks to effectively forecast river water levels upstream of Tranh Culvert in North Vietnam's Bac Hung Hai irrigation system. The mathematical model was thoroughly studied and evaluated by using hydrological data from six gauge stations over a period of twenty-two years between 2000 and 2022. Furthermore, the results of the developed model were also compared to those of the long-short-term memory neural networks model. This study performs four predictions, with a forecast time ranging from 6 to 24 hours and a time step of 6 hours. To validate and test the model's performance, the Nash-Sutcliffe efficiency coefficient (NSE), mean absolute error, and root mean squared error were calculated. During the testing phase, the NSE of the model varies from 0.981 to 0.879, corresponding to forecast cases from one to four time steps ahead. The forecast results from the model are very reasonable, indicating that the model performed excellently. Therefore, the proposed model can be used to forecast water levels in North Vietnam's irrigation system or rivers impacted by tides.