World Academy of Science, Engineering and Technology
International Journal of Civil and Architectural Engineering
Vol:11, No:05, 2017

Scour Depth Prediction around Bridge Piers Using Neuro-Fuzzy and Neural Network Approaches

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Abstract : The prediction of scour depth around bridge piers is frequently considered in river engineering. One of the key aspects in efficient and optimum bridge structure design is considered to be scour depth estimation around bridge piers. In this study, scour depth around bridge piers is estimated using two methods, namely the Adaptive Neuro-Fuzzy Inference System (ANFIS) and Artificial Neural Network (ANN). Therefore, the effective parameters in scour depth prediction are determined using the ANN and ANFIS methods via dimensional analysis, and subsequently, the parameters are predicted. In the current study, the methods’ performances are compared with the nonlinear regression (NLR) method. The results show that both methods presented in this study outperform existing methods. Moreover, using the ratio of pier length to flow depth, ratio of median diameter of particles to flow depth, ratio of pier width to flow depth, the Froude number and standard deviation of bed grain size parameters leads to optimal performance in scour depth estimation.

Keywords : adaptive neuro-fuzzy inference system (ANFIS), artificial neural network (ANN), bridge pier, scour depth, nonlinear regression (NLR)
Conference Title : ICCEAE 2017 : International Conference on Civil, Environmental and Architectural Engineering
Conference Location : Paris, France
Conference Dates : May 18-19, 2017