Abstract

Providing safe drinking water and also agricultural and industrial water requirements is the major challenges of our time. The most problematic area of Pishin dam is improper management and limited water resources resulted from the droughts of recent years. Therefore, the monitoring systems in developing management plans to deal with drought and wet year are very important. Markov chain is a probabilistic process for modeling random phenomena that is described by a set of conditions and situations and also by transition probability between conditions. By using Lay-1 Markov chain, equilibrium probability matrix for both Pirdan and Pishin stations were obtained. Equilibrium probability matrix for Pirdan station was obtained by multiplying 12 times conditional transition matrix in itself and dry and wet periods in long term are with equal ratio. Equilibrium probability matrix was achieved by multiplying 13 times conditional probability matrix of Pishin station in itself so that the amount or value of stable dry periods were 35% and wet periods were 65%. These results show that the probability of stability of dry condition is reduced by increasing multiplication of matrix in itself. In general, equilibrium probability matrix indicates how many percents of average time in a specific or given condition will remain for each station in the long term. Multi-layer Perceptron Network (MLP) by learning technique of Levenberg-Marquardt (LM) and Training and Learning Algorithm was used in Artificial Neural Network. Among the 50 models, MLP4, MLP17 and MLP21 for Pirdan station and MLP26 and MLP50 for Pishin station as the flow of the predictably selected models have been selected. The dry months of predicted flow rates are with a frequency of .32, .27, .35, .31, and .29 respectively whereas the wet months are with a frequency of .68, .73, .65, .61, and .71 respectively. Normalizing data to zero and one and applying Sigmoid Activated Function (SAF) used in the hidden layer enhanced the performance of these networks. The use of large neurons in the hidden layer has caused to improve the performance of these networks. MLP21 model with the frequency of .35 and .65 for dry and wet months respectively has shown the closest results to the frequency of .50 and .50 for dry and wet months of observatory flow and the frequency of .50 and .50 of Markov chain for Pirdan station. MLP26 model with the frequency of .31 and .69 for dry and wet months respectively has predicted the closest results to the frequency of .375 and .635 for dry and wet months of observatory flow and the frequency of .35 and .65 of Markov chain for Pishin station.

Key words: drought, wet year, Markov chain. Artificial Neuron Network, Pishin dam

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