Artificial Neural Networks for Flood Forecasting Using Partial Mutual Information-Based Input Selection

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Abstract

Artificial Neural Networks (ANN) is a powerful tool for addressing various practical problems and it has been extensively applied in areas of water resources. In this study, Artificial Neural Networks (ANNs) were developed for flood forecasting at specific locations on the Han River. The Partial Mutual Information (PMI) technique was used to select input variables for ANNs that are neither over-specified nor under-specified while adequately describing the underlying input-output relationships. Historical observations including discharges at the Paldang Dam, flows from tributaries, water levels at the Paldang Bridge, Banpo Bridge, Hangang Bridge, and Junryu gauge station, and time derivatives of the observed water levels were considered as input candidates. Lagged variables from current time t to the previous five hours were assumed to be sufficient in this study. A three-layer neural network with one hidden layer was used and the neural network was optimized by selecting the optimal number of hidden neurons given the selected inputs. Given an ANN architecture, the weights and biases of the network were determined in the model training. The use of PMI-based input variable selection and optimized ANNs for different sites were proven to successfully predict water levels during flood periods.

Keywords : ANN, PMI, Flood forecasting, Han River

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