

Application of artificial neural network model in regional frequency analysis: Comparison between quantile regression and parameter regression techniques.

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Abstract

Due to the development of technologies, complex computation of huge data set is possible with a prevalent personal computer. Therefore, machine learning methods have been widely applied in the hydrologic field such as regression-based regional frequency analysis (RFA).

The main purpose of this study is to compare two frameworks of RFA based on the artificial neural network (ANN) models: quantile regression technique (QRT-ANN) and parameter regression technique (PRT-ANN). As an output layer of the ANN model, the QRT-ANN predicts quantiles for various return periods whereas the PRT-ANN provides prediction of three parameters for the generalized extreme value distribution. Rainfall gauging sites where record length is more than 20 years were selected and their annual maximum rainfalls and various hydro-meteorological variables were used as an input layer of the ANN model. While employing the ANN model, 70% and 30% of gauging sites were used as training set and testing set, respectively. For each technique, ANN model structure such as number of hidden layers and nodes was determined by a leave-one-out validation with calculating root mean square error (RMSE). To assess the performances of two frameworks, RMSEs of quantile predicted by the QRT-ANN are compared to those of the PRT-ANN.

Keywords : Machine learning, Artificial neural network, Regional frequency analysis

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