

Daily discharge forecasting using WANNs coupled with nonlinear bias correction techniques

MUKESH K. TIWARI & C. CHATTERJEE

Agricultural and Food Engineering Department, Indian Institute of Technology, Kharagpur, India
mukesh@agfe.iitkgp.ernet.in

Abstract A wide variety of rainfall–runoff models have been developed and applied for discharge forecasting. Hydrological prediction usually relies on incomplete and uncertain process descriptions that are deduced from sparse and noisy data sets. While conventional (deterministic) ANNs have been traditionally used in these studies, the use of wavelet-based ANNs (WANNs) is a more recent development. Discharge data are decomposed into wavelet components via discrete wavelet transform, and the new wavelet series, consisting of the sum of selected wavelet components, is used as input for the ANN model. Seven years data of daily discharge from seven upstream gauging stations are used for daily discharge forecasting for 1–5 day lead time forecasts at Naraj site in Mahanadi River basin, India. Performances of the neuro-wavelet hybrid forecasting model provided satisfactory results for up to 2-day lead time forecasts. Performance of the wavelet-ANN model is found to be better compared to traditional ANN for all the lead times. The resulting outputs are corrected for bias using nonlinear correction techniques. Nonlinear bias corrections are found to be very suitable tools for daily discharge forecasting using ANN, but the wavelet-ANN performance does not improve using the nonlinear bias correction technique showing that the wavelet technique itself reduces the systematic shifting between the observed and predicted discharge.

Key words neural networks; wavelet; forecasting; discharge