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ENHANCING DISCHARGE FORECASTING ACCURACY USING DATA-DRIVEN MODELS. CASE STUDY: KALEYBAR-CHAI, IRAN

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Abstract

Forecasting the stream-flow of rivers holds significant importance in the realm of water resource management and hazard mitigation. Thus, this study endeavours to predict the monthly streamflow of the Kaleybar-Chai River in Iran by employing various machine learning models, namely Support Vector Machine (SVM), Gene Expression Programming (GEP), Multilayer Perceptron (MLP), and Wavelet Neural Network (WNN). The analysis utilizes an in-situ dataset spanning from 1992-2020 of number 335. Streamflow of lag-1 to lag-5 days were utilized as input variables for the MLMs, determined based on the auto-correlation (ACF) and partial auto-correlation function (PACF) analysis of historical river flow data. Performance assessment metrics, encompassing the coefficient of determination (R^2), root mean square error (RMSE), Nash–Sutcliffe model efficiency coefficient (NSE), and maximum developed discrepancy ratio ($Q_{DDR(max)}$), were employed to discern and select the superior model. The outcomes affirmed the potential and efficacy of all employed MLMs. Nonetheless, the MLP exhibited superiority across both the training and testing phases, as indicated by the following performance metrics: (R^2= 0.9969, RMSE=0.1392 (m^3/s), NSE=0.9960, $Q_{(DDRmax)}$=7.89) for the training phase, and (R^2=0.9892, RMSE=0.2168 (m^3/s), NSE=0.9820, $Q_{(DDRmax)}$=4.10) for the testing phase.

Key words: hydrological variables, machine-learning algorithms, river discharge, water resource management

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