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Forecasting water level and discharge in the Kupa river basin

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Due to the global climate change and corresponding more severe and frequent floods, there is an emergent need for putting in operation early warning systems for floods. Forecasting river water level and discharge is the main component of such a system. In this paper we present our forecasting model, for which we used historical sensor data about water level, discharge, and precipitation from 24 hydrological and 20 meteorological stations within the Kupa river basin in Croatia. In the development of our model, we have evaluated the Vector Auto-Regression (VAR) and LSTM (Long Short-Term Memory) methods as representatives of statistical and machine learning approaches, respectively. The VAR and LSTM methods were evaluated on 4 downstream hydrological stations while forecasting water level and discharge for one to five days in the future. To achieve the best forecasting results we have combined data from all upstream hydrological and meteorological stations. Our evaluation has shown that LSTM is more complex to train and computationally intensive to run than a simple VAR method, but proved better than VAR method in almost all forecasting scenarios for all observed hydrological stations in the Kupa river basin. The only exception was in forecasting scenarios for several days into the future where both methods achieved similar forecasting performance.

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