

Reservoir Inflow Forecasting Based on Gradient Boosting Regressor Model - A Case Study of Bhadra Reservoir, India

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Reservoir Inflow Forecasting Based on Gradient Boosting Regressor Model - A Case Study of Bhadra Reservoir, India

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Abstract:

Reservoirs are essential infrastructures in human life. It provides water supply, flood control, hydroelectric power supply, navigations, irrigation, recreation, and other functionalities. To provide these services and resources from the reservoir, it's necessary to know the reservoir system's inflow. The Machine Learning (ML) techniques are widely acknowledged to forecast the inflow into the reservoir system. In this paper, the popular ML technique, Gradient Boosting Regressor (GBR), is used to predict the reservoir system's inflow. This technique has been applied to the Bhadra reservoir of India at a daily time scale. In this study, the effect and complex relationship of climate phenomenon indices with inflow has been considered. The considered climate phenomenon indices are (1) Arctic Oscillation (AO), (2) East Pacific/North Pacific Oscillation (EPO), (3) North Atlantic Oscillation (NAO), (4) Extreme Eastern Tropical Pacific SST (NINO1+2), (5) Eastern Tropical Pacific SST (NINO3), (6) Central Tropical Pacific SST (NINO4), (7) East Central Tropical Pacific SST (NINO34), (8) Pacific North American Index (PNA), (9) Southern Oscillation Index (SOI), (10) Western Pacific Index (WP), (11) Seasonality. In this paper, different parameter settings have been discussed on the models' performances. The analysis of the GBR method for the Bhadra reservoir includes the number of estimators, maximum depth. The results indicate that the GBR model can capture the inflow's peaks and droughts into the reservoir systems. The study demonstrates how ML methods can be used to generate accurate reservoir inflow predictions.