Streamflow simulation and forecasting using remote sensing and machine learning techniques

ABSTRACT

The study investigates the integration of remote sensing data and machine learning (ML) techniques in streamflow simulation and forecasting in Klang River Basin. The motivation behind the research lies in the need for improved accuracy in streamflow prediction to support effective water resource management and flood control in Malaysia. Five ML models, including K-Nearest Neighbours (KNN), Support Vector Machines (SVM), Random Forests (RF), Artificial Neural Network (ANN), and Long Short-Term Memory (LSTM) were tested, with 25 different model configurations trained on datasets from Malaysia's Department of Irrigation and Drainage (DID) and climate data from NASA's Giovanni Portal. Among the models, RF − III showed the best performance with SMAPE, MdAPE and Lp values of 0.36 and 0.37 and 0.908, respectively. Further analysis underscores air temperature's substantial impact on streamflow prediction, deviating significantly from the benchmark value. The findings contribute to advancements in streamflow forecasting, offering potential applications in flood management and water resource planning for the region.