Flow Assessment and Prediction in the Asa River Watershed using different Artificial Intelligence Techniques on Small Dataset

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Abstract

Common hydrological problems of developing countries include poor data management, insufficient measuring devices and ungauged watersheds, leading to small or unreliable data availability. This has greatly affected the adoption of artificial intelligence techniques for flood risk mitigation and damage control in several developing countries. While climate datasets have recorded resounding applications, but they exhibit more uncertainties than ground-based measurements. To encourage AI adoption in developing countries with small ground-based dataset, we propose data augmentation for regression tasks and compare performance evaluation of different AI models with and without data augmentation. More focus is placed on simple models that offer lesser computational cost and higher accuracy than deeper models that train longer and consume computer resources, which may be insufficient in developing countries. To implement this approach, we modelled and predicted streamflow data of the Asa River Watershed located in Ilorin, Kwara State Nigeria. Results revealed that adequate hyperparameter tuning and proper model selection improve streamflow prediction on small water dataset. This approach can be implemented in data-scarce regions to ensure timely flood intervention and early warning systems are adopted in developing countries.

Keywords : flood, developing countries, artificial intelligence, disaster preparedness, early warning systems

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