Flood Prediction Using Machine Learning and GIS as an Early Warning System

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SUMMARY

The perennial annual recurrence of floods in the Greater Accra Region brings along with it destruction and loss of lives. Flooding is considered one of the most destructive natural hazards. Prediction of these events is one sure way to mitigate their effects on lives and properties. This study developed a prediction model for extreme floods using an artificial neural network and GIS to locate impacted geographic areas prone and/or impacted by flooding. It also assessed the performance of some flood models in Greater Accra Region. A Machine Learning method (Long Short-Term Memory (LSTM)) and Geographic Information System with the application of an Analytic Hierarchy Process (AHP) relying on multicriteria method was applied considering factors such as distance to river, Land Use Land Cover (LULC), lithology, drainage density, soil classes, rainfall, elevation, slope and rainfall-runoff modelling were combined to predict floods within the study area. Historical floods were mapped to validate the results of the model. The results of the model showed high accuracy in predicting flash floods and demonstrates that the locations where floods would occur could be geospatially indicated to an accuracy of 80%. It further indicated the various risk zones (Very high, high, medium and low) to flooding. The rainfall prediction gave a correlation figure of 0.953 which was considered a good correlation between the prediction model and hence made the early warning system very sensitive. The model could be improved for the prediction of the floods by considering shorter rainfall periods and data from more rainfall stations.

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FIG Working Week 2023
Protecting Our World, Conquering New Frontiers
Orlando, Florida, USA, 28 May–1 June 2023