Augura: Flood Risk Prediction Using Machine-Learning and Geographic Information Systems

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Flood forecasting in India is carried out by the determination of the water level at flood forecasting stations. The level forecasts are issued once water levels in a station reach a predefined warning level, which helps local authorities to determine response measures to the floods. A new approach has been explored in this project, which involves using the mean gauge heights, rainfall and the river discharge values of prior days to forecast the mean gauge heights up to four days in advance. These features were used as input for an Extreme Learning Machine (ELM) Regressor. The number of units in the ELM was optimized to obtain the maximum coefficient of determination using the Particle Swarm Optimization Algorithm (PSO). Gauge and discharge data from the Jenapur flood forecasting station (Brahmani river, Odisha), the Anandpur station (Baitarani river, Odisha) and the Domohani station (Tista River, West Bengal) were used to create models for mean gauge height prediction. These models were then cross-validated using 10-fold Cross Validation, with Mean Squared Error (MSE) and the coefficient of determination (R-squared) as parameters for evaluation of the models. The models show promising results, with the one-day-in-advance model having MSE 0.14 and R-squared 0.85 for Jenapur, MSE 0.23 and R-squared 0.75 for Anandpur and MSE 0.08 and R-squared 0.83 for Domohani. For identifying at-risk areas in the Brahmani-Baitarani river basin, a risk analysis of the region was also conducted in Geographical Information Systems using Digital Elevation Models, Geomorphological Maps and Land Use/Land Cover Maps.

Awards Won:

Third Award of $1,000

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