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# A NOVEL APPROACH BASED ON ARTIFICIAL FISH SWARM (AFS) ALGORITHM FOR LANDSLIDE SUSCEPTIBILITY MAPPING

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## Abstract

Landslide is a widespread natural disaster that has severe impacts worldwide. To reduce the potential risk of landslides in hilly areas, it is crucial to have a comprehensive landslide susceptibility map, which can aid in planning and managing urban development. This study aims to develop landslide susceptibility maps for Penang Island, Malaysia, using an innovative approach of the artificial fish swarm algorithm (AFS) as the classifier. The spatial landslide inventory map is developed by gathering information from field surveys, historical records, and digital aerial images. The AFS model uses twelve input factors related to landslides. Normalization techniques, such as minimum and maximum (Min-Max), mean and standard deviation (Mean-SD), median and inter-quartile range (Median-IQR), as well as dimensionality reduction methods like principal component analysis (PCA) and canonical variate analysis (CVA), are utilized to pre-process landslide data. Six different input data approaches are used to train the AFS model based on normalization and dimension reduction methods. The classification accuracies in terms of the model's performance are assessed by applying the testing data to the trained model. In addition, the AFS model is validated using the area under the receiver of the characteristics (ROC) curve. The results demonstrate that the AFS model trained with Mean-SD normalization and PCA approach provides the best classification accuracy and verification performance using the ROC curve. The produced landslide susceptibility maps can be valuable for urban planners and land managers in Penang Island for effective risk management and land use planning.

*Key words:* artificial fish swarm, dimensionality reduction, landslide, normalization, susceptibility

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