Artificial Intelligence-based Geospatial Framework to Simulate Landslide Susceptibility

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In the context of natural disasters, landslides are more significant because of the threat to life and property that they cause. The uncertainty of the occurrence of landslides, and the scarcity of accurate models for precise predictions have led to huge losses. Studies have been conducted in this paradigm worldwide to provide both quantitative and qualitative analysis. Moreover, many approaches have been taken to develop machine learning-based quantitative models. Yet, there is a timely need to develop an explainable artificial intelligence model to predict and interpret landslides with logical arguments comprehensively. This study focused on developing an artificial intelligence model incorporating both training and logic to predict landslides which can be used to map landslide susceptibility. Landslide data, including topographical, climatic, and geological factors affecting landslides, related to Sri Lanka, retrieved from the National Building Research Organization of Sri Lanka, were incorporated in modelling an artificial neural network which learns on its own through training to give predictions. Comparatively higher accuracy was obtained from the artificial neural network model over those in the literature. In addition, a logical/rule-based model based on Expert Systems and Fuzzy Reasoning is planned to be incorporated into the artificial neural network model to predict the landslide occurrence giving probabilities and reasoning. Finally, a Geospatial framework will be developed to simulate landslide susceptibility. The approach will lead to mitigating the drawbacks of existing early warning systems and present the general public with a logical and more accurate mapping of landslide susceptibility and minimize losses to life and property.

Keywords: *landslide susceptibility mapping, artificial neural networks, expert systems, fuzzy reasoning, explainable artificial intelligence*