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Predicting Rainfall-Induced Landslides in Muriwai, Auckland: A Comprehensive Multi-Model Approach for Enhanced Risk Management

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Landslide studies hold significant importance in understanding and mitigating the risks associated with these geohazards. Particularly in regions like New Zealand, where diverse topography and climatic conditions contribute to frequent landslide occurrences, such studies are crucial. This research focuses on Muriwai, Auckland, a region that has experienced substantial landslide activity triggered by rainfall. The study adopts a multi-model approach, integrating both empirical and process-based models to predict rainfall-induced landslides. This approach leverages the strengths of individual models, including logistic regression, random forest, support vector machines, artificial neural networks, and decision trees, thereby enhancing the robustness and accuracy of predictions. A comprehensive dataset, comprising historical landslide records, climatic data, and terrain and geological data, is used to train and validate these models. The data is spatially aligned within a unified Geographic Information System (GIS) database, ensuring consistency and accuracy in the analysis. The multi-model ensemble provides a probabilistic prediction of landslide occurrence, which is visualized as a landslide susceptibility map. This map serves as a valuable tool for understanding the spatial distribution of landslide risks in Muriwai. The performance of each model and the ensemble is evaluated using several metrics, ensuring the reliability of the predictions. The results are interpreted to understand the influence of different factors, particularly climatic parameters, on landslide occurrences. This study's findings contribute to effective landslide risk management and mitigation strategies in Muriwai, Auckland, and provide valuable insights for similar studies in other regions.

Keywords
Landslide Prediction; Rainfall-Induced Landslides; Multi-Model Approach; Muriwai; Auckland Risk Management

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