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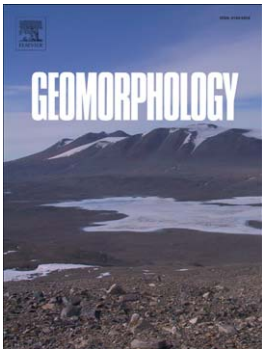

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ACCEPTED MANUSCRIPT

Spatial Prediction of Landslides Using Hybrid Machine Learning Approach Based on Random Subspace and Classification and Regression Trees

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Abstract

A hybrid machine learning approach of Random Subspace (RSS) and Classification And Regression Trees (CART) is proposed to develop a model named RSSCART for spatial prediction of landslides. This model is a combination of the RSS method which is known as an efficient ensemble technique and the CART which is a state of the art classifier. The Luc Yen district of Yen Bai province, a prominent landslide prone area of Viet Nam, was selected for the model development. Performance of the RSSCART model was evaluated through the Receiver Operating Characteristic (ROC) curve, statistical analysis methods, and the Chi Square test. Results were compared with other benchmark landslide models namely Support Vector Machines (SVM), single CART, Naïve Bayes Trees (NBT), and Logistic Regression (LR). In the development of model, ten important landslide affecting factors related with geomorphology, geology and geo-environment were considered namely slope angles, elevation, slope aspect, curvature, lithology, distance to faults, distance to rivers, distance to roads, and rainfall. Performance of the RSSCART model (*AUC* = 0.841) is the best compared with other popular landslide models namely SVM (0.835), single CART (0.822), NBT (0.821), and LR (0.723). These results indicate that performance of the RSSCART is a promising method for spatial landslide prediction.

Keywords: Landslide susceptibility map; Machine Learning; Random Subspace; Classification and Regression Trees.

1. Introduction

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