

## Machine Learning-based landslide susceptibility mapping - Inje area, South Korea

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### Abstract

In recent years, the number of landslides in Korea has been increasing due to extreme weather events such as localized heavy rainfall and typhoons. Landslides often occur with debris flows, land subsidence, and earthquakes. They cause significant damage to life and property. 64% of Korea's land area is made up of mountains, the government wanted to predict landslides to reduce damage. In response, the Korea Forest Service has established a 'Landslide Information System' to predict the likelihood of landslides. This system selects a total of 13 landslide factors based on past landslide events. Using the LR technique (Logistic Regression) to predict the possibility of a landslide occurrence and the accuracy is known to be 0.75. However, most of the data used for learning in the current system is on landslides that occurred from 2005 to 2011, and it does not reflect recent typhoons or heavy rain. Therefore, in this study, we will apply a total of six machine learning techniques (KNN, LR, SVM, XGB, RF, GNB) to predict the occurrence of landslides based on the data of Inje, Gangwon-do, which was recently produced by the National Institute of Forest.

To predict the occurrence of landslides, it is necessary to process converting landslide events and factors data into a suitable form for machine learning techniques through ArcGIS and Python. In addition, there is a large difference in the number of data between areas where landslides occurred or not. Therefore, the prediction was performed after correcting the unbalanced data using Tomek Links and Near Miss techniques. Moreover, to control unbalanced data, a model that reflects soil properties will use to remove absolute safe areas.

**Keywords:** Machine Learning, Landslide, Unbalanced data, Inje-Gangwondo

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