

## Landslide susceptibility mapping using support vector machine and GIS at the Golestan province, Iran

### ABSTRACT

The main goal of this study is to produce landslide susceptibility map using GIS-based support vector machine (SVM) at Kalaleh Township area of the Golestan province, Iran. In this paper, six different types of kernel classifiers such as linear, polynomial degree of 2, polynomial degree of 3, polynomial degree of 4, radial basis function (RBF) and sigmoid were used for landslide susceptibility mapping. At the first stage of the study, landslide locations were identified by aerial photographs and field surveys, and a total of 82 landslide locations were extracted from various sources. Of this, 75% of the landslides (61 landslide locations) are used as training dataset and the rest was used as (21 landslide locations) the validation dataset. Fourteen input data layers were employed as landslide conditioning factors in the landslide susceptibility modelling. These factors are slope degree, slope aspect, altitude, plan curvature, profile curvature, tangential curvature, surface area ratio (SAR), lithology, land use, distance from faults, distance from rivers, distance from roads, topographic wetness index (TWI) and stream power index (SPI). Using these conditioning factors, landslide susceptibility indices were calculated using support vector machine by employing six types of kernel function classifiers. Subsequently, the results were plotted in ArcGIS and six landslide susceptibility maps were produced. Then, using the success rate and the prediction rate methods, the validation process was performed by comparing the existing landslide data with the six landslide susceptibility maps. The validation results showed that success rates for six types of kernel models varied from 79% to 87%. Similarly, results of prediction rates showed that RBF (85%) and polynomial degree of 3 (83%) models performed slightly better than other types of kernel (polynomial degree of 2 = 78%, sigmoid = 78%, polynomial degree of 4 = 78%, and linear = 77%) models. Based on our results, the differences in the rates (success and prediction) of the six models are not really significant. So, the produced susceptibility maps will be useful for general land-use planning.

**Keyword:** Landslides; Support vector machine (SVM); Geographical information systems (GIS); Remote sensing; Golestan province; Iran