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A different aspect to use of some soft computing methods for landslide susceptibility mapping

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In landslide literature, several applications of soft computing methods such as artifical neural networks (ANN), fuzzy inference systems, and decision trees for landslide susceptibility mapping can be found. In many of these studies, the effectiveness and validation of the models used are also discussed. To carry out analyses, more than one software, for example one statistical package and one geographical information systems software (GIS), are generally used together. In this study, four different soft computing techniques were applied for obtaining landslide susceptibility mapping only by one GIS software. For this purpose, Multi Layer Perceptron (MLP) back propagation neural network, Fuzzy Adaptive Resonance Theory (ARTMAP) neural network, Self-organizing Map (SOM) and Classification Tree Analysis (CTA) approaches were applied to the study area. The study area was selected from a part of Trabzon (North Turkey) city which is one of the most landslide prone areas in Turkey. Initially, five landslide conditioning parameters such as lithology, slope gradient, slope aspect, stream power index (SPI), and topographical wetness index (TWI) for the study area were produced in GIS. Then, these parameters were analysed by MLP, Fuzzy ARTMAP, SOM and CART soft computing classifiers of the IDRISI Taiga GIS and remote sensing software. To accomplish the analyses, two main input groups are needed. These are conditioning parameters and training areas. For training areas, initially, landslide inventory map which was obtained by both field studies and topographical analyses was compared with lithological unit classes. With the help of these comparison, frequency ratio (FR) values of landslide occurrence in the study area were determined. Using the FR values, five landslide susceptibility classes were differentiated from the lowest FR to highest FR values. After this differentiation, the training areas representing the landslide susceptibility classes were determined by using FR values of the lithology classes. By following this step, both landslide susceptibility conditioning parameters and training areas were used together in MLP, Fuzzy ARTMAP, SOM and CTA soft computing classifiers, and four landslide susceptibility index maps were finally obtained. In the final step, the maps obtained were validated by landslide occurrence areas. By validation of the landslide susceptibility maps produced, it was noticed that using by the methods proposed in this study to produce landslide susceptibility map with high accuracy is possible. Also, this approach proposed shows us that only one GIS software is enough when ANN methods are applied for landslide susceptibility mapping rather than using more than one software.