Title:	Landslide Susceptibility Assessment Near Koyna Reservoir Region Using Random Forest Model
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Abstract:	Recent years records extensive landsliding in the steep slopes of Western Ghats, inflicting widespread destruction and loss of life. In order to mitigate the landslide hazard threat to the communities, a crucial strategy is to develop accurate landslide susceptibility maps for the vulnerable regions. In this context, this work devised an integrated techniques combining machine learning and satellite remote sensing that aimed at preparing landslide susceptibility maps (LSM). The evaluation took place in the Koyna reservoir region of Maharashtra, a highly vulnerable zone, that had not undergone a proper assessment previously. For this, at first, a landslide inventory data is created by employing multi-temporal Sentinel-2 images and incorporates normalized difference vegetation index (NDVI) to automate the landslide mapping procedure. Following this, 11 factors (topographic, hydrologic, climate etc.) relevant to the landslide conditioning in the region were prepared as predictors and dependent variable. This work further explores the predictive performance power of different machine learning models in LSM such as logistic regression (LR), decision trees (DT), random forest (RF) and K-nearest neighbors (KNN) model for training and validation. Our proposed model underwent training and validation using distinct datasets: 70% for training and 30% another for testing. Accuracy of different models were then performed by the help of confusion matrix, and the receiver operating characteristic (ROC) curve. Results of comparative evaluation of the different model demonstrated that the random forest (RF) outperforms other models including 1 | Pagelogistic regression, K-nearest neighbors and decision tree classifiers. The metrics of ROC area under the curve values is as follows for training: RF = 77.1%, LR = 65.27%, DT= 61.18%, KNN= 66.67% and whereas, testing with RF = 76.2, LR =65.81%, DT= 61.78% and KNN =66.68% produces larger differences in the accuracies between the four datasets. Since RF model gives the best results, the final landslide susceptibility map is prepared using the training data used for the RF model. The resultant LSM map from the RF model shows a zone of high susceptibility around the Koyna reservoir region, and the model results predict 98% of the mapped landslide areas in the moderate to very high susceptibility classes, suggesting satisfactory performance of the modeled output. These insights hold significant potential for enhancing landslide risk management and guiding land utilization strategies within the Koyna region. Keywords: machine learning, landslide susceptibility, Koyna reservoir, Mahabaleshwar, 2021 landslides.
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