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Machine Learning Approaches for Landslide Susceptibility Mapping Using Multi-temporal Remote Sensing Data

Landslides pose significant threats to human lives, infrastructure, and the environment worldwide. Accurate prediction and mapping of landslide susceptibility are crucial for effective disaster risk management and land-use planning. This study explores the application of advanced machine learning techniques in conjunction with multi-temporal remote sensing data for improved landslide susceptibility mapping. We compare the performance of several machine learning algorithms, including Random Forest, Support Vector Machines, and Deep Learning approaches, in predicting landslide occurrence across diverse geographical regions. The integration of multi-temporal remote sensing data allows for the incorporation of dynamic environmental factors, enhancing the temporal accuracy of susceptibility models. Our results demonstrate the superior performance of ensemble-based methods in capturing complex terrain-landslide relationships. The proposed methodology achieves an overall accuracy of 85% in identifying high-risk landslide zones, outperforming traditional statistical approaches. This research contributes to the growing body of knowledge on data-driven landslide susceptibility assessment and provides valuable insights for the development of early warning systems and sustainable land management practices in landslide-prone areas.

Keywords: landslide susceptibility; machine learning; remote sensing; multi-temporal analysis; Random Forest; Support Vector Machines; Deep Learning

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