Exploring the Capability of TransUNet Model for Landslide Classification

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ABSTRACT

Landslides are severe natural disasters because of their destructiveness and unpredictability, impacting human life and property. Deep learning techniques have been demonstrated to be of exceptional performance in feature extraction. Among modern deep learning techniques, TransUNet, which integrates the capabilities of Transformers and Convolutional Neural Networks, enhances segmentation performance. Originally designed to enhance medical image segmentation, TransUNet can also be applied to the analyses of remote sensing data or images. However, its extension to other applications requires careful evaluation of its efficacy. This study aims to explore the benefits of applying TransUNet for landslide detection and classification, which is divided into four stages. Firstly, based on publicly available landslide datasets, pre-images, and post-images are pre-prepossed to meet the requirements of the TransUNet framework for images and labels. Secondly, various spectral bands, training epochs, and loss functions are utilized. The third phase is assessing classification performance during the validation stage. Finally, ground truth data are used to verify the prediction results. Preliminary results of theis research indicate that TransUNet can detect landslides and classify non-landslide areas, old landslide sites, newly occurred landslides and recover areas effectively. However, there is room for improvement. In particular, the limited number of samples constrained the depth of model training. Future research will aim to diversify training data to increase sample size and combine different deep-learning methods to enhance classification accuracy.

Keywords: TransUNet, landslide, image segmentation, satellite image