Convolutional Neural Network Based Image Classification: A Case Study in the Polar Regions

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【Abstract】

Along with recent advances in hardware, techniques, optimisation skills, and sufficient data, deep learning (DL) has recently become a new trend in the machine learning community because of its potential for learning representations of data better using multiple layers instead of shallow architectures. Among diverse approaches in DL, this study focuses on convolutional neural network (CNN), which is powerful for image classification, to identify landcover types in optical remote sensing (RS) images. Two applications in the Polar regions are demonstrated: 1) sea ice type classification and 2) vegetation classification. To evaluate the performance of CNN, traditional classifiers such as k-nearest neighbor and support vector machine are tested. In both cases, CNN significantly outperforms the traditional methods. Thousands of hidden features in deep layers developed by CNN properly remedy the limitations of the optical RS data, and play an important role in improving classification accuracy and generating thematic maps.

Keywords: Deep learning, Convolutional neural network, Polar remote sensing