Hyperspectral image reconstruction by deep convolutional neural network for classification

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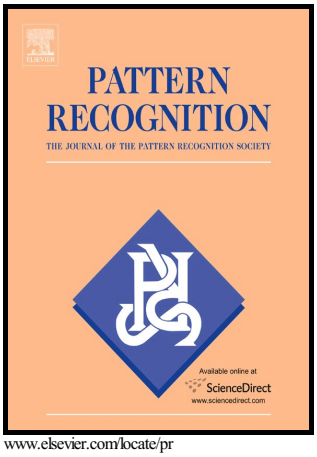

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Abstract

Spatial features of hyperspectral imagery (HSI) have gained an increasing attention in the latest years. Considering deep convolutional neural network (CNN) can extract a hierarchy of increasingly spatial features, this paper proposes an HSI reconstruction model based on deep CNN to enhance spatial features. The framework proposes a new spatial features-based strategy for band selection to define training label with rich information for the first time. Then, hyperspectral data is trained by deep CNN to build a model with optimized parameters which is suitable for HSI reconstruction. Finally, the reconstructed image is classified by the efficient extreme learning machine (ELM) with a very simple structure. Experimental results indicate that framework built based on CNN and ELM provides competitive performance with small number of training samples. Specifically, by using the reconstructed image, the average accuracy of ELM can be improved as high as 30.04%, while performs tens to hundreds of times faster than those state-of-the-art classifiers.

Keywords: hyperspectral imagery; deep convolutional neural network; extreme learning machine; reconstruction; band selection; pattern classification.