

Convolutional Neural Network Architecture for Aerial Scene Classification

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Abstract

Aerial scene classification is an important computer vision task that aims to automatically identify and categorize land-use and land-cover patterns from high-resolution aerial and satellite imagery. The large variation in object appearance, spatial distribution, illumination, scale, and scene complexity makes accurate classification challenging. This study presents a Convolutional Neural Network (CNN) architecture for aerial scene classification that automatically learns discriminative spatial and spectral features directly from aerial images. The proposed architecture consists of multiple convolutional layers for hierarchical feature extraction, followed by batch normalization and nonlinear activation functions to improve learning stability and representation capability. Pooling layers are incorporated to reduce spatial dimensions while retaining important visual information, and dropout is applied to minimize overfitting. The extracted deep features are passed through fully connected layers and a SoftMax classifier to assign each image to its corresponding aerial scene category. Data augmentation techniques such as rotation, scaling, cropping, and horizontal flipping can be employed to improve model generalization and robustness to variations in image orientation and appearance. The architecture is designed to provide an efficient and reliable solution for automated aerial image interpretation. Such a system can support applications including urban planning, environmental monitoring, agricultural analysis, disaster management, land-use mapping, and geographic information system (GIS) applications. The study demonstrates the potential of CNN-based deep learning for achieving accurate and automated aerial scene classification.

Keywords: Convolutional Neural Network, Aerial Scene Classification, Deep Learning, Remote Sensing, Image Classification, Feature Extraction, Aerial Imagery, Land-Use Mapping, Computer Vision, GIS.