

## Deep Embedded Clustering-Based Bounding Box Detection for Enhanced Object Recognition in Remote Sensing Aerial Images

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### Abstract

Aerial image analysis through remote sensing is an important tool in urban planning as well as environmental surveillance, but the correct identification of objects is challenging because of different scales, occlusions, and background clutters. Old object detectors have the problem of low detection and high rates of false detection. In order to eliminate these restrictions, this paper presents a Deep Embedded Clustering (DEC)-based bounding box detection algorithm. The system combines hybrid clustering and multi-scale feature representation to enhance the detection of objects of different sizes in complicated aerial scenes. A pre-trained CNN is then used to extract high-dimensional features and they are then clustered based on a KL divergence loss. In the clustering module, the positions of bounding boxes are refined at any dynamic time by weighted adjustment of centroid positions, which enhances the accuracy of localization. The framework greatly improves accuracy and recalls by lowering the false detections and improving feature separability. The experimental assessment shows that its accuracy is 94.7% with a 15% false-positives decrease, which is better than existing detectors, including YOLOv5, Faster R-CNN and SSD.

### Keywords

Deep Embedded Clustering, Bounding Box Detection, Remote Sensing, Object Recognition, Aerial Images.

