ABSTRACT

Automatic object detection and segmentation in satellite imagery play a crucial role in geospatial analysis, environmental monitoring, disaster management, precision agriculture, and defense applications. However, detecting and segmenting objects in satellite images is highly challenging due to low resolution, small object sizes, scale variations, occlusions, dense backgrounds, and illumination changes. This survey explores state-of-the-art deep learning techniques, including convolutional neural networks , transformer-based models, and hybrid architectures, applied to satellite imagery for object detection and segmentation. It examines key challenges such as data scarcity, model generalization, computational efficiency, and real-time processing, while highlighting advancements in multi-scale feature extraction, domain adaptation, and transfer learning. Additionally, the study evaluates the impact of synthetic aperture radar , hyperspectral imaging, and fusion-based approaches in improving detection performance. By analyzing existing methodologies, benchmark datasets, and emerging trends, this survey provides valuable insights into the effectiveness of deep learning-based approaches in enhancing satellite image analysis for geospatial intelligence and automated remote sensing applications.