ABSTRACT

Deep learning has revolutionized image segmentation by enabling high-accuracy pixel-level classification through automatic feature extraction from large datasets, eliminating the need for handcrafted features. It effectively handles both semantic segmentation (classifying each pixel into categories) and instance segmentation (distinguishing individual object instances). Hierarchical feature learning in deep models captures rich spatial and contextual information, enhancing segmentation precision. Modern advancements such as encoder-decoder networks, attention mechanisms, and transformers have further improved performance. Key applications include medical diagnostics, autonomous vehicles, satellite imagery analysis, and scene understanding, making deep learning indispensable for tasks requiring detailed image analysis.