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Layer-Level Feature Aggregation Network for Effective Semantic Segmentation of Fine-Resolution Remote Sensing Images

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Abstract : Models based on convolutional neural networks (CNNs), in conjunction with Transformer, have excelled in semantic segmentation, a fundamental task for intelligent Earth observation using remote sensing (RS) imagery. Nonetheless, tokenization in the Transformer model undermines object structures and neglects inner-patch local information, whereas CNNs are unable to simulate global semantics due to limitations inherent in their convolutional local properties. The integration of the two methodologies facilitates effective global-local feature aggregation and interactions, potentially enhancing segmentation results. Inspired by the merits of CNNs and Transformers, we introduce a layer-level feature aggregation network (LLFA-Net) to address semantic segmentation of fine-resolution remote sensing (FRRS) images for land cover classification. The simple yet efficient system employs a transposed unit that hierarchically utilizes dense high-level semantics and sufficient spatial information from various encoder layers through a layer-level feature aggregation module (LLFAM) and models global contexts using structured Transformer blocks. Furthermore, the decoder aggregates resultant features to generate rich semantic representation. Extensive experiments on two public land cover datasets demonstrate that our proposed framework exhibits competitive performance relative to the most recent frameworks in semantic segmentation.

Keywords : land cover mapping, semantic segmentation, remote sensing, vision transformer networks, deep learning
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