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(57) Abstract :

The present invention relates to a system and method for medical image segmentation addressing data imbalance challenges through a hardware-implemented partial decoder attention network (100) with contour-weighted compound loss function. The system comprises an image acquisition module (101), a preprocessing unit (102), an encoder network (103) with squeeze-and-excitation blocks (104), a partial decoder module (105) incorporating receptive field blocks (106), a channel-wise attention module (107), a decoder network (108), and a loss computation unit (109). The contour-weighted compound loss function combines contour-weighted cross-entropy loss and separable Dice loss computed through a dedicated hardware accelerator (110). The morphological erosion processor (111) extracts contour-weighted maps from segmentation targets. The system achieves improved segmentation accuracy for small anatomical structures while maintaining computational efficiency through optimized memory utilization and parallel processing architecture.

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