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Prediction of Alzheimer's Disease Based on Multi-Attentional Mechanisms using Brain PET Image

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Positron Emission Tomography (PET) Imaging of the brain might become the most effective imaging technique to predict Alzheimer's disease. However, the definition of the brain in PET images is low and the lesion area is not easy to define, so the accuracy of traditional machine learning algorithms in predicting Alzheimer's disease from PET images is low. Deep learning algorithms can effectively improve the accuracy of prediction. Here, a deep learning model based on multi-attention mechanisms is constructed for the prediction of Alzheimer's disease. Firstly, in order to improve the images and reduce the loss of spatial information caused by convolution, a soft-attention mechanism was introduced to embed non-local modules and CBAM modules into the prediction model, which effectively solved the problems of the lack of detail information and the lack of connection between channels in PET images after deep convolution. Secondly, a split-attention mechanism was introduced, and the influence of different parameters of feature images with different sizes on the prediction accuracy was enhanced by using a packet network. Finally, head movement correction, image registration, craniocerebral separation, Gaussian smoothing and other image preprocessing were performed on the acquired PET images to effectively improve the image features of Alzheimer's disease focal areas in brain PET images. The experimental results showed that the prediction accuracy, sensitivity and specificity of the model in the ADNI database for Alzheimer's disease were 90.5%, 86.1% and 93.5% respectively, which could provide more accurate diagnostic results compared with the existing methods.

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