Detection of Low Dose CT Pulmonary Nodules Based on 3D CNN-CapsNet

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Abstract

To improve the detection rate of pulmonary nodules in early lung cancer screening, a low-dose CT pulmonary nodule detection algorithm based on 3D CNN-CapsNet (3D convolution neural network and capsule network) was presented. However, the convolution kernel size of the traditional CNN is relatively simple at each layer, and it is difficult to obtain more abundant features, which is not effective for medical images with a hierarchical structure and does not fully consider the spatial information of medical sequence data. CapsNet is a new network architecture that can be used to classify, using a group of neurons as a capsule to replace the traditional neural networks, it may be made to the attribute information and spatial feature extraction. The network structure we designed includes FCN and CapsNet. First, the convolution kernels of different sizes are used to extract features at different scales. Then enter the initial feature map to obtain the first part into the designed CapsNet to get the final classification result. Through the experimental verification of the ELCAP database, the nodule detection rate is 95.19%, the sensitivity is 92.31%, the specificity is 98.08% and the F1-score is 0.95 which are much better than other baseline methods.

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