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Abstract

Deep neural networks (DNNs) have recently indicated outstanding performance on image learning features tasks while Convolutional neural networks (CNNs) have been applied for classification tasks by reducing spectral variations and the spectral correlations of the model which existed in images. In this paper, we independently approached our work as a sequence of steps. We first implemented sparse autoencoders as unsupervised algorithm to obtain learned features in two hidden layers for the DNN model by evaluating the appropriate input features and the optimal number of hidden units, which allow us to validate basic capabilities of the dataset. Secondly, we trained a deep CNN which consisted of five main convolutional layers, followed by Rectified Linear Units (ReLUs) layers, max-pooling layers, three fully-connected layers and a final softmax probability layer, to classify the high-resolution medical images of Computed Tomography (CT) into five anatomical classes, corresponding to five organs in abdominal regions. As a result, we considerably achieved the classification accuracy of 83.74 ± 3.34% in testing. We also visualized the layer representations on CT datasets, where they indicated the state-of-the-art performance, and could hold much promise to initialize further research on computer-aided diagnosis.

Keywords (separated by '-')

DNN - Sparse autoencoders - Optimization - CNN - Convolution - ReLUs - Pooling - Fully-connected - Softmax - CT images