Transfer Learning in Medical Image Classification

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Abstract:

Deep learning (DL) is becoming an important tool for diagnosis, and interpretation of medical images by decreasing the time spent in predictions, improving the accuracy in identifying abnormalities and, therefore, enhancing the clinical outcomes of patients. We use medical images (for example, ChestX-ray 14 dataset) comprising 112,120 frontal-view chest X-ray images of 30,805 unique patients. We use transfer learning (TL) techniques which are very effective for specific domains when datasets are small. TL applications in the medical field are significantly improving the performance of medical image analysis and classification. We identify three major techniques in the literature, namely CheXNet, Attention Guided convolutional neural network, and dual-net architecture. In this study, we survey current DL and TL approaches used in medical images. We then use the DenseNet-121 architecture pretrained on ImageNet as our baseline model and perform a binary classification on our dataset. The DenseNet-121 is a 121 layer of deep convolutional neural network, implemented using Keras with TensorFlow backend. Preliminary results show validation accuracy of about 96%. In future, we will focus on fine-tuning approaches, hyperparameter optimization, adding non-image patient data, finding optimal data augmentation and model architecture, generating high resolution medical images using generative adversarial networks to improve performance.