The Effectiveness of Transfer Learning Using a Pre-trained DINET Model for Medical Image Classification

ABSTRACT

With increased complex deep learning networks that require longer training time of model parameters, the strengths of powerful GPU computing and transfer learning methods has provided opportunities for computer vision problems, such as image analysis. Moreover, transfer learning (TL) techniques have been widely used for image analysis, however, there is little understanding on how learned feature maps are transferred. In this research, we investigate the characteristics of using transfer learning for medical image classification. We propose to use our novel architecture (DINET) as a pre-trained model to investigate salient problems such as model performance, learned representations etc. A technical implementation includes the use of mini-batch, stochastic gradient descent, dropout and L2 regularization, batch normalization, optimization of epochs, and data augmentation techniques. We use a GPU environment with a TITAN V 12GB with two cards for the training and modeling process. Our novel architecture is implemented using Keras utilizing the TensorFlow backend. Preliminary results of DiNET v1 shows promising results over Inception network when trained on a standard image dataset, specifically CIFAR-10 dataset. Therefore, in this study we seek to answer the following research questions (RQs): 1. What is the effectiveness of transfer learning techniques using DINET on medical image classification? 2. What is the optimal cut-off point that gives the best model performance? Using TL strategies, the primary objective is to produce innovations that maximize the use of multi-scale feature learning capable of handling complex datasets, for example, the Chest X-ray 14 dataset. Our limitation includes: using a small dataset and Inception v1 for evaluation purposes. Future work involves investigating the effect of size and quality of medical images on model performance; training high resolution medical images using modern deep learning methods such as generative adversarial networks (GANs); and examining the behavioral performances of using different DINETx versions on medical image classification problems.