Disease Type Prediction

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Introduction

Disease type diagnosis from X-rays is of low-cost and simple. However, lack of experienced doctors and high miss misdiagnosed rates makes it a challenge. We tried different neural network models with our preprocessing dataset and data augmentation. Apart from that, we also used general patient information as additional inputs. For the training models, we tried Alexnet, VGG16 ,desnet121, Resnet18, Resnet34, Resnet50 and Resnet101 and use scalable weighted sample,Learning rate scheduler and Bayesian Optomization to get better accuarcy.

Methodology

•Dataset

We use the dataset provided by hackerearth. Dataset includes X-ray pictures with disease labels and general information of the patients, i.e., gender and age. There are 14 types of different diseases in total.

*Images: Each row of data has one X-ray image and its disease label.

—18000 training images of size 1024*1024*3

—12000 prediction images of size 1024*1024*3

*Text in CSV format: Each row of data has 6 rows, i.e., row id, age, gender, view position, image_name, detected disease.

•Data preprocessing

Downsample the image size from 1024*1024*3 to 256*256*3

•Augmentation

By doing the following steps, we augment our images.Aim of step3 to 5 is to avoid overfitting.

- equalize histogram to increase contrast of the images.
- invert images to better extract the features.
- random crop images to 224*224*3.
- random horizontal flip images with p=0.5.
- color gitter with brightness=0.3.
- normalization with mean=[0.485,0.456,0.406],std=[0.229,0.224,0.225].

•Architecture

We designed scalable weighted sample to balance the difference of numbers of differenttypes of diesease. Learning rate scheduler is used to accelerate the convergence speed of neural network and Bayesian Optomization is aimed to get better accuarcy.

—**scalable weighted sample**

In order to balance the difference of the total number of different types of disease.

$$y = \alpha x_i^{\beta},\ \alpha = \sqrt{\max x_i}$$

where x_i:original number of images of ith disearse, $\beta \in [0.5, 1.2]$ is paramter, $y_i$is number of images of ith disearse after weighted.

—**Learning rate scheduler**

decrease the step size scalarly to accelerate the convergence speed of neural network and get better result.

—**Bayesian Optomization**

Optimatize a blackbox, where we input the range of paramters and get better accuacy with the respective paramters.

Training

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Generalization Results

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Conclusion

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