

BS6207 Assignment 4 Report

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1. Data Preprocess

We are provided with 4 classes of images, but they are randomly numbered and named. We are supposed to label the images with class name and resort them. The test size is set as 100, which indicates take 100 from each of the 4 classes as test data. The remaining images are for training and validating:

	Artifacts	Cancer Region	Normal Region	Others
Training&Validating	2280	2778	1087	384
Testing	100	100	100	100

After training set splitting, we resize the image into 128*128 with one channel as gray scale, and randomly flip the given PIL image with probability = 0.5, and tune the brightness, contrast and saturation of the images, and finally convert to tensor.

```
train_transform=transforms.Compose([
    transforms.RandomResizedCrop(128, scale=(0.64, 1.0), ratio=(1.0,1.0)),
    transforms.RandomHorizontalFlip(),
    transforms.ColorJitter(brightness=0.4, contrast=0.4, saturation=0.4),
    transforms.ToTensor(),
```

2. Build a CNN and training

Firstly, the validating ratio (the portion of validation set) is set as 0.2. Then build a CNN with 4 stacks of following layers:

Convolutional layer	Transforms the input image in order to extract features from it.
Relu	To introduce non-linearity in the image
batch normalization	Standardize the inputs to a layer for each mini-batch
Maxpooling	The objective is to down-sample an input representation and highlight the most important features.

Other than that, we also have 60% dropout rate of the nodes to prevent overfitting. Adam gradient descent is also used in case we cannot escape the local minima.

After training this model with batch size=64 and epoch=30, we get the accuracy of training (blue line) and validation set (orange line) as shown in the figure 1 below, the test accuracy of this model is 94%.

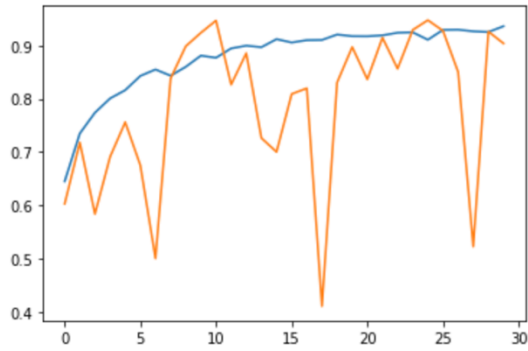


Figure 1

3. Fine tune the learning rate

The learning rate is fine tuned in the range of 0.1, 0.001, 0.0001 with epoch = 13, and the accuracy is shown as below in figure 2 and 3:

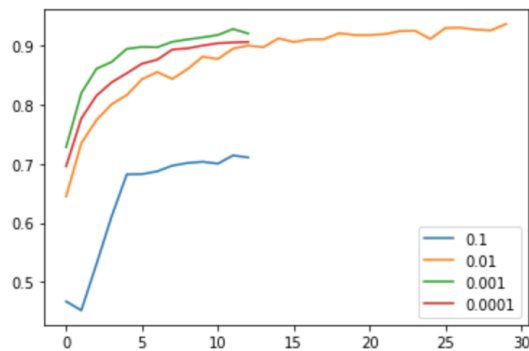


Figure 2: training

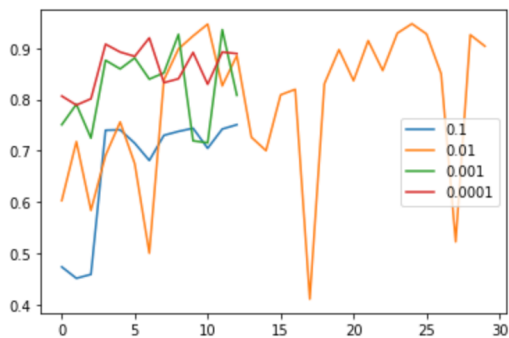


Figure 3: validation

It can be seen that learning rate with 0.1 is the worst. The performance of the model cannot be improved through epoch and the accuracy only reach near 0.75. However, smaller learning rates are much better. 0.001 is the best in those 3 different learning rates.