Computer Vision HW2 Report

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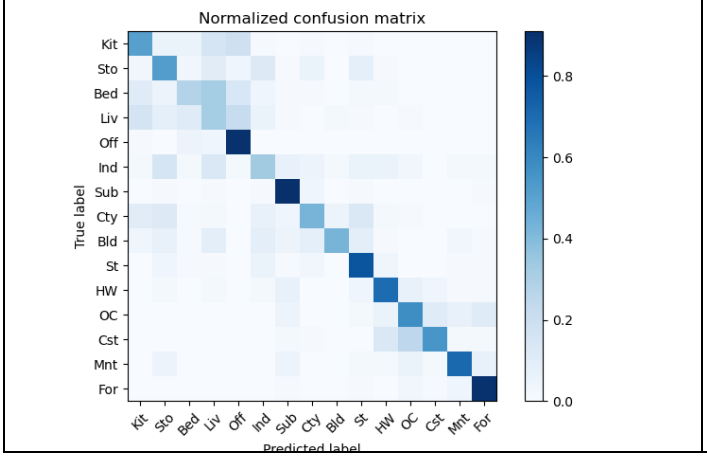
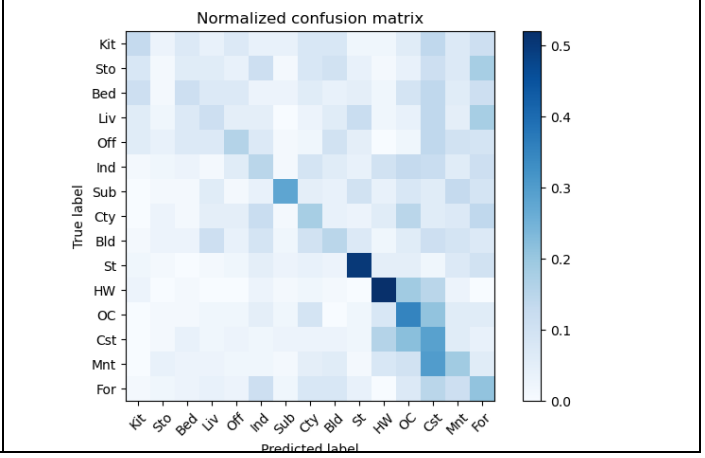
Part 1. (10%)

• Plot confusion matrix of two settings. (i.e. Bag of sift and tiny image representation) (5%)

Ans:

Bag of sift	Tiny image representation
	

• Compare the results/accuracy of both settings and explain the result. (5%)

Ans:

Overall, we could see that bag of sift has given a better result. The dark colors on its diagonals and light colors on other parts of the matrix showed that it has more true positives / correct prediction. However, not all the colors in the diagonal are dark. For example, in the case of “Bed”, we could see that its diagonal color is quite light, however, it is still darker in comparison to other row, hence it still means that is has more correct prediction.

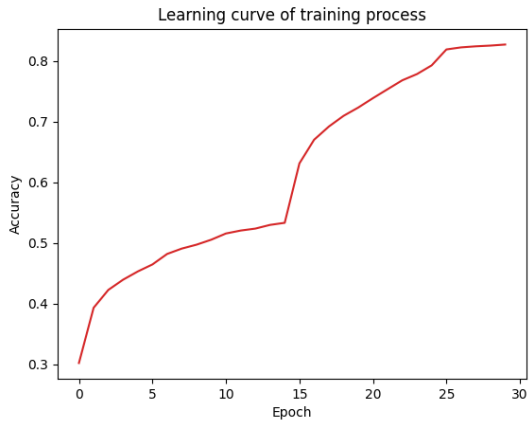
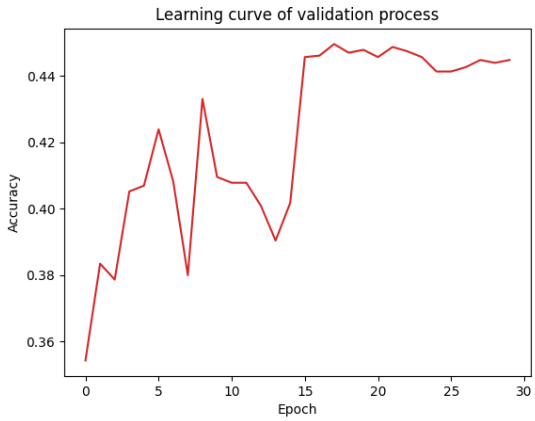
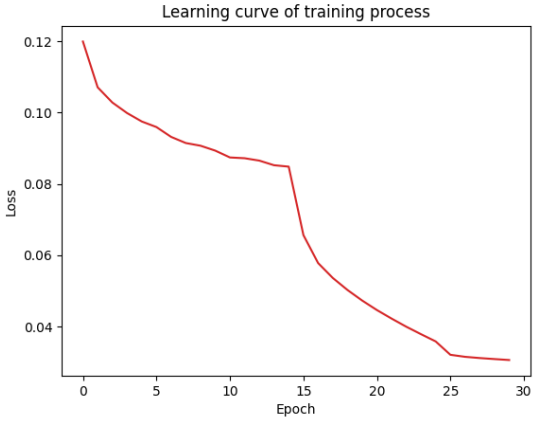
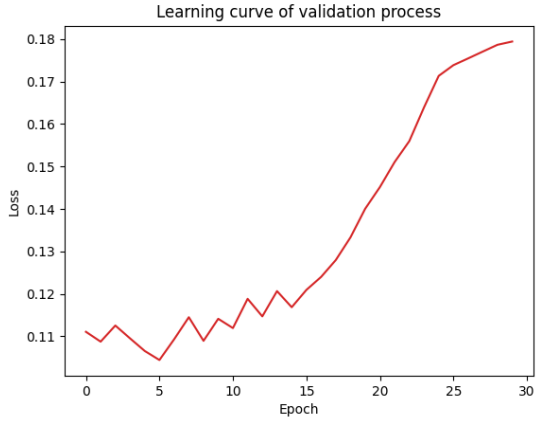
In tiny image representation, on the other hand, we could see that the darker colors are not centered in its diagonal. There are still many columns where the colors are almost similar. Hence this showed that there are more false positives detection that are made.

Part 2. (35%)

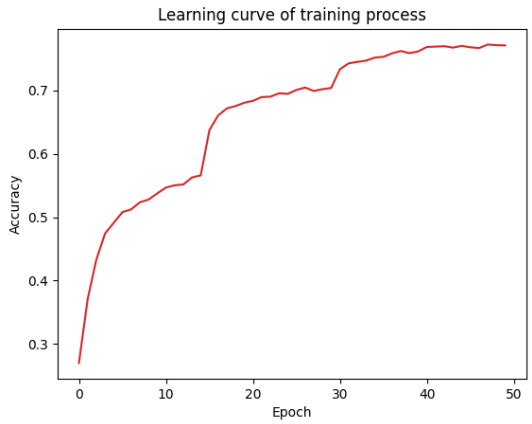
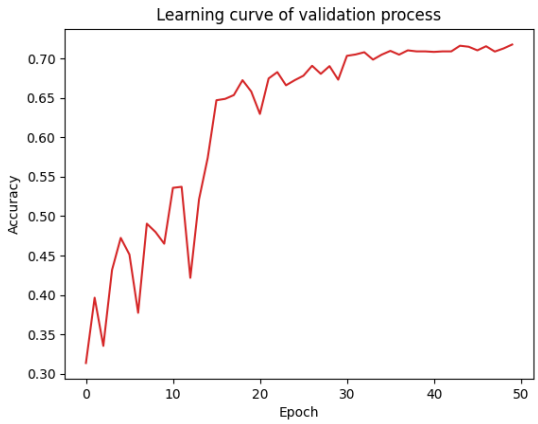
• Compare the performance on residual networks and LeNet. Plot the learning curve (loss and accuracy) on both training and validation sets for both 2 schemes. 8 plots in total. (20%)

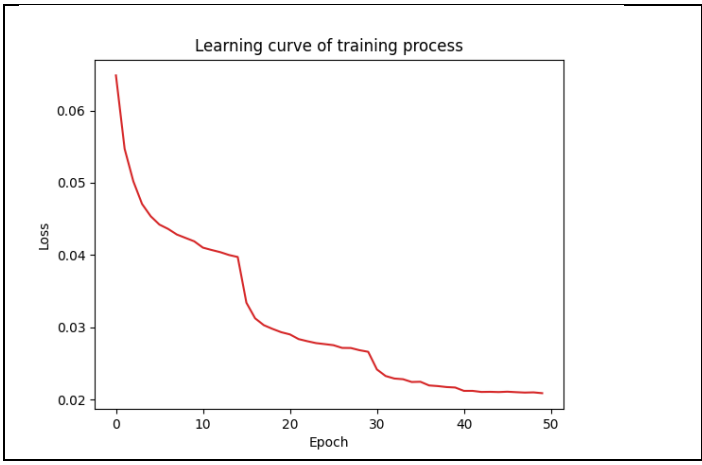
Ans:

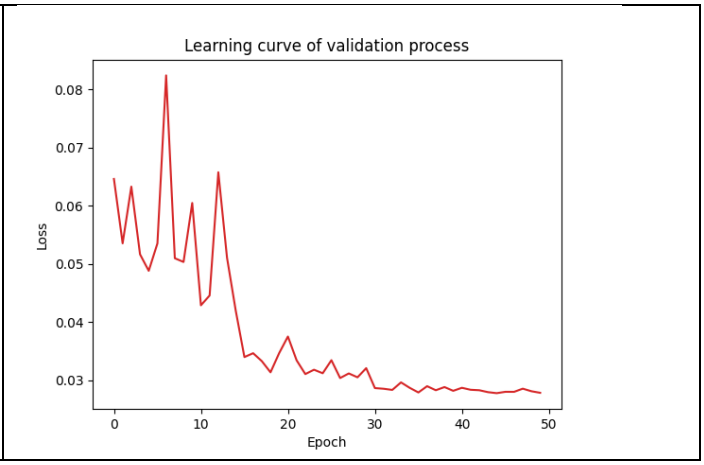
LeNet:

Training (Accuracy)	Validation (Accuracy)
	
Training (Loss)	Validation (Loss)
	

myResnet:

Training (Accuracy)	Validation (Accuracy)
	
Training (Loss)	Validation (Loss)





LeNet has good accuracy value in training which is more than 0.8 however, in validation, it barely reaches 0.45. This shows the problems with LeNet. However, in residual networks we can see that accuracy of both training and validation does not differ by much, they go hand in hand. The residual networks succeed in reaching 0.7 in its training accuracy, and so does its validation. An interesting thing is the loss learning curve of the validation process of LeNet. Instead of decreasing, it increases even when the training loss decreases. This surely is a big problem. In residual networks both training and validation process showed a decreasing trend in its loss learning curve.

In both cases of LeNet and residual nets, interestingly all the training curves has smooth texture however in validation learning curve, it has lots of ups and downs, it does not have a smooth curve.

• Attach basic information of the model you use including model architecture and number of the parameters. (5%)

Ans:

The model was based on Wide-ResNet 28-10 model. However, some modifications were made to reduce the training time. The total number of parameters are 1,198,810 with size of approximately 4.5MB.

The overall model consists of 3 layers. The number of residual blocks used in each layer will be of our own choice. In this case, only 1 residual block is used in each layer. For each residual blocks, it starts with batch normalization, followed by ReLU, convolution, droupout, down sampling, another batch normalization and then convolution. After the residual blocks, the layer will lastly do batch normalization, ReLU and adaptive average pool before returning.

• Briefly describe what method do you apply? (e.g. data augmentation, model architecture, loss function, semi-supervised etc.) (10%)

Ans:

The method applied here mainly includes data augmentation and model architecture. The data augmentation used here are padding (4, ‘reflect’), horizontal flip and random crop (32). The model used is based on wide-ResNet as described above. The models used happen to perform surprisingly well and achieved an accuracy of around 0.8 with public datasets. Lastly are the hyperparameters tuning, with total of 50 epochs, the batch size is 32, learning rate is 0.1 and scheduler of gamma 0.1 are also used to boost up the training quality.