Computational Vision

Sheet 1 — CSCI 4270

Homework 5: Problem 2 Discussion

1. **Fully Connected Network:** When considering the design of the fully connected network, I used the built-in functionality from the nn.Module. After reading in the images from the files, I decided to run the training data with a learning rate of 1e-4 and 10 epochs, yielding a result of 77.2% accuracy.

   When designing the code specifically, I created a training function and test function to calculate the accuracy on the given data set. For validation, I decided to adjust the learning rate and epochs. For the learning rate I used [1e-5, 1e-4, 1e-3, 1e-2] and for epochs [10, 50, 100]. After I selected the model with the highest accuracy which had 50 epochs and a learning rate of 1e-3 with 78.9% accuracy. Then running this same model on the test data-set yielded an accuracy of 77.2%.

   Now analyzing the confusion matrices where the indices are in the order of [”grass”, ”ocean”, ”redcarpet”, ”road”, ”wheatfield”] classifications. We find that generally the models are very good at recognizing a redcarpet background (probably because it is very distinct in comparison to the others). Overall, the accuracy for the other classifications are pretty similar.

2. **CNN:** When designing the convolutional neural network, I based it off the network in lecture 19, but only included 1 pooling layer and had to adjust the sizes of each layer. After the convolutional layer, the results get input into a 2 layered fully connected network. For the training network, I used a learning rate of 1e-4 and 10 epochs, yielding a 78.8% accuracy.

   I used the same training and test functions for this part, along with the same parameters for learning rates and epochs for the validation step. After running the validation, the final model has a learning rate of 0.0001 and 100 epochs, with a 76.8% accuracy on the validation. On the test data-set the model had a 77.2% accuracy (it is purely coincidence that this matches the previous network, I double checked and the confusion matrices differ). It is interesting to note that the training data-set has a higher accuracy than the validation set.

   Overall, I am happy with the results of both of these neural networks as they do a reasonably good job in predicting the background in images.

   Also as a side note, all this code was written and trained in Google Colab. So for the submission python file I simply copied all the code over.