COMP 4107 Assignment Four

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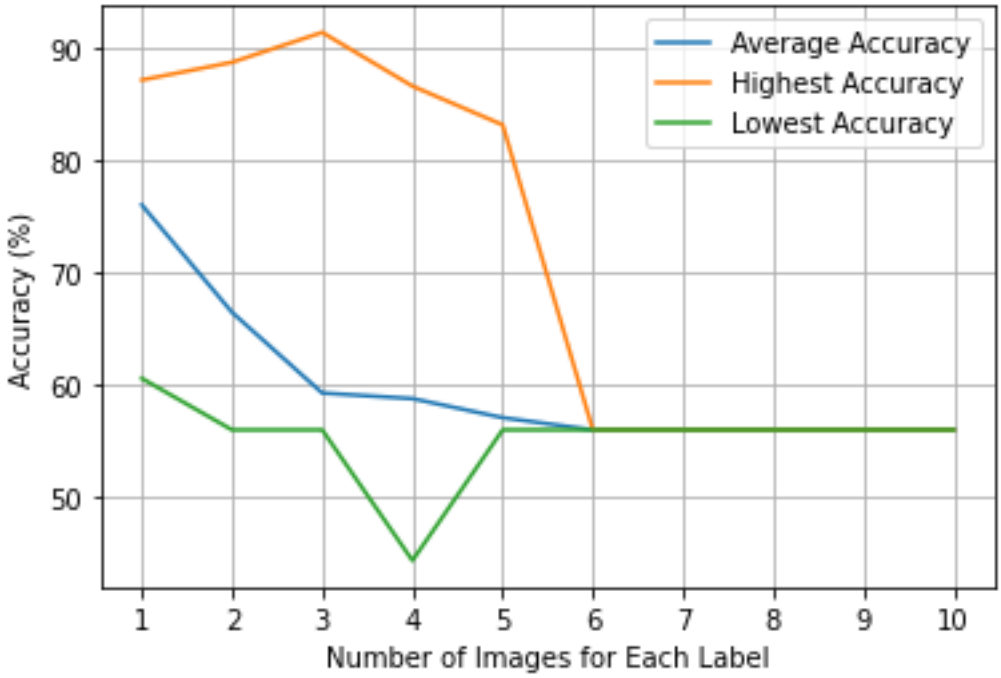
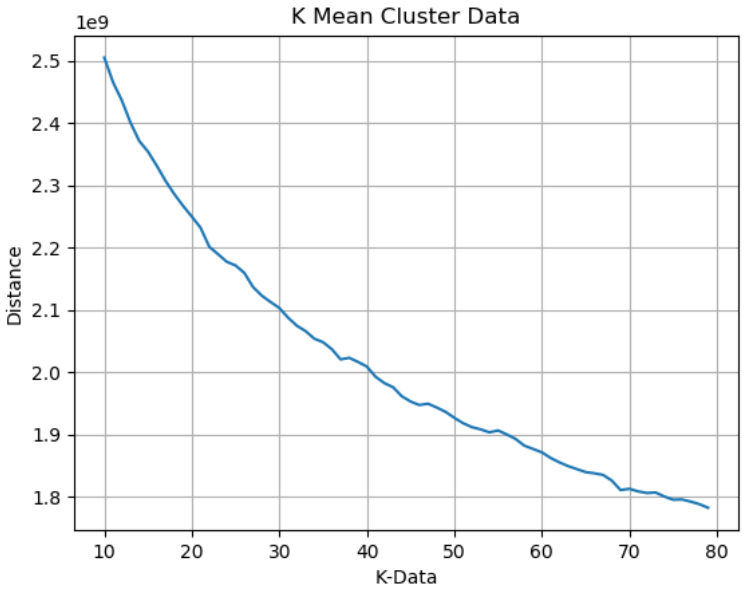
1. To document the classification accuracy, we ran the algorithm 10 time for each number of images and gathered the average accuracy as well as the highest and lowest accuracies. The x-axis on the graph below shows the number of images for each label used. I.e. at 1, we used one image of ‘1’ and one image of ‘5’ for a total of 2 images, at 2 we used two images of a ‘1’ and two images of ‘5’ for a total of 4 images and so on. The images used are randomly sampled at each iteration which gives a variety of accuracies. We can draw a few conclusions from the graph below. The accuracy tends to decrease the more images we use for training as the pattern blurs with more images. 1 image shows the highest average accuracy while 2 images show a lower but still more than a guessing accuracy. At 3 images, the average is just short of 60% and we can observe a significant outlier that most likely skews the average up. With 4 and 5 images, the average is similar to the one at 3 images but is lower which is most likely due to less high accuracy outliers. From 6 to 10 images, the accuracy remains constant at 56%. From the trend observed, we can conclude that from 10+ images, the accuracy of the algorithm is most likely 56% which is almost just guessing.

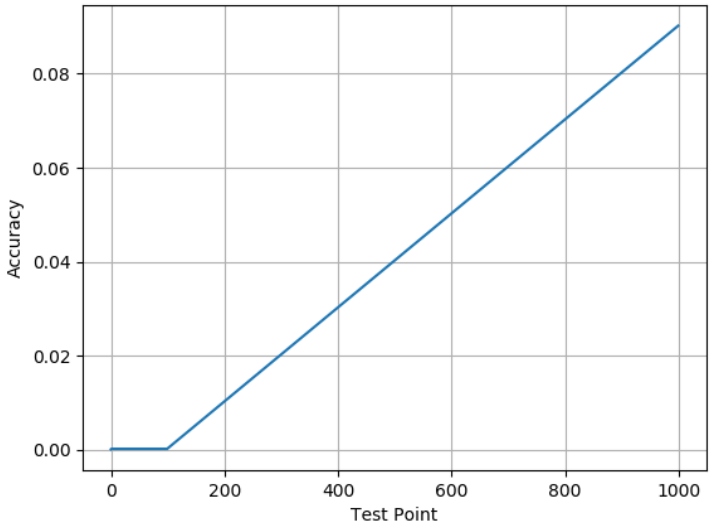


2.

1. Attached are the results of the K-Means search from the algorithm:

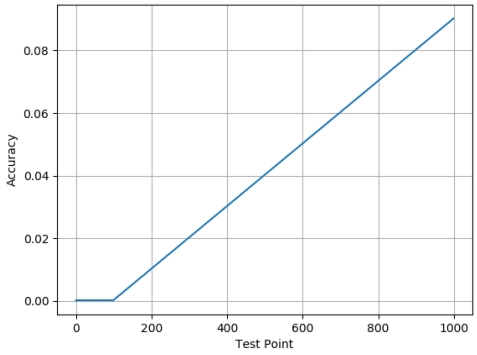


2. Attached are the results of a ten fold cross validation on the dataset:

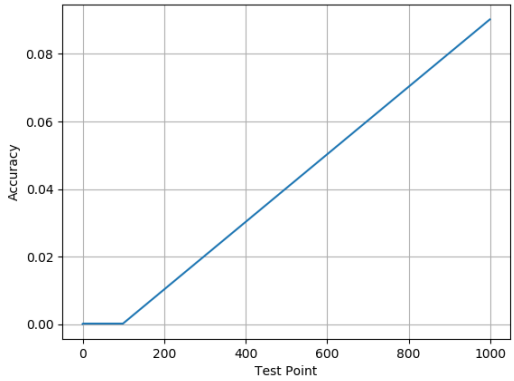


Clearly, the code did not work as intended but these are the results of the folds.

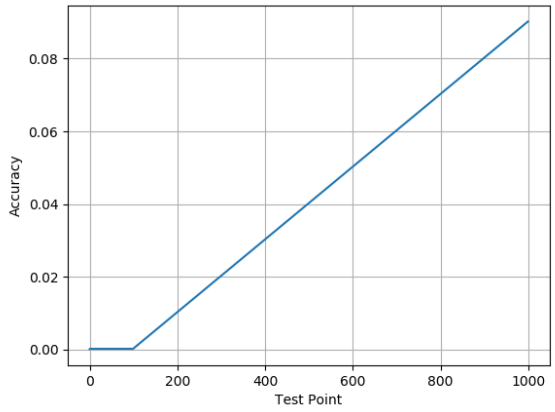
3. By changing the number of hidden neurons through changing the kmean value, we get:



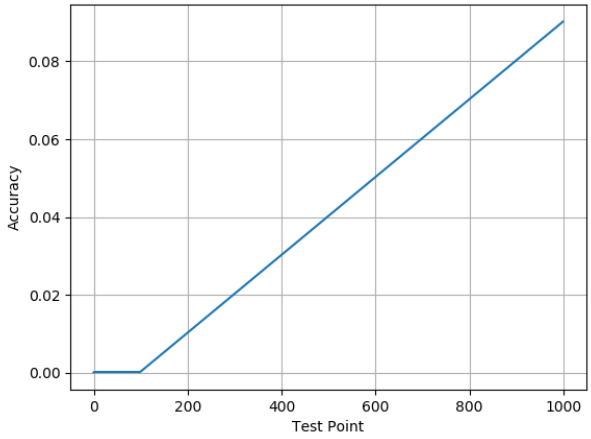
10 neurons



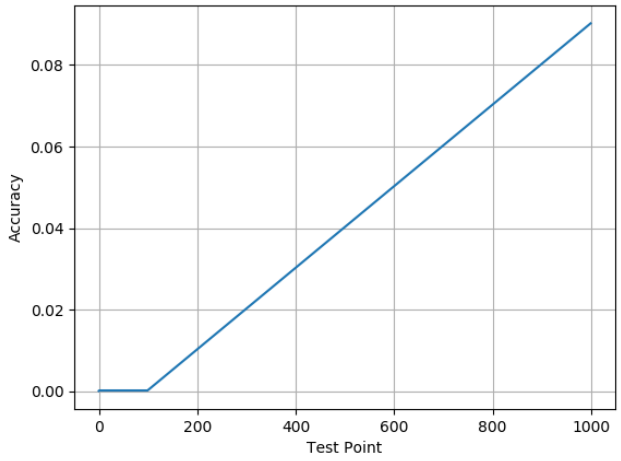
15 neurons



20 neurons



40 neurons

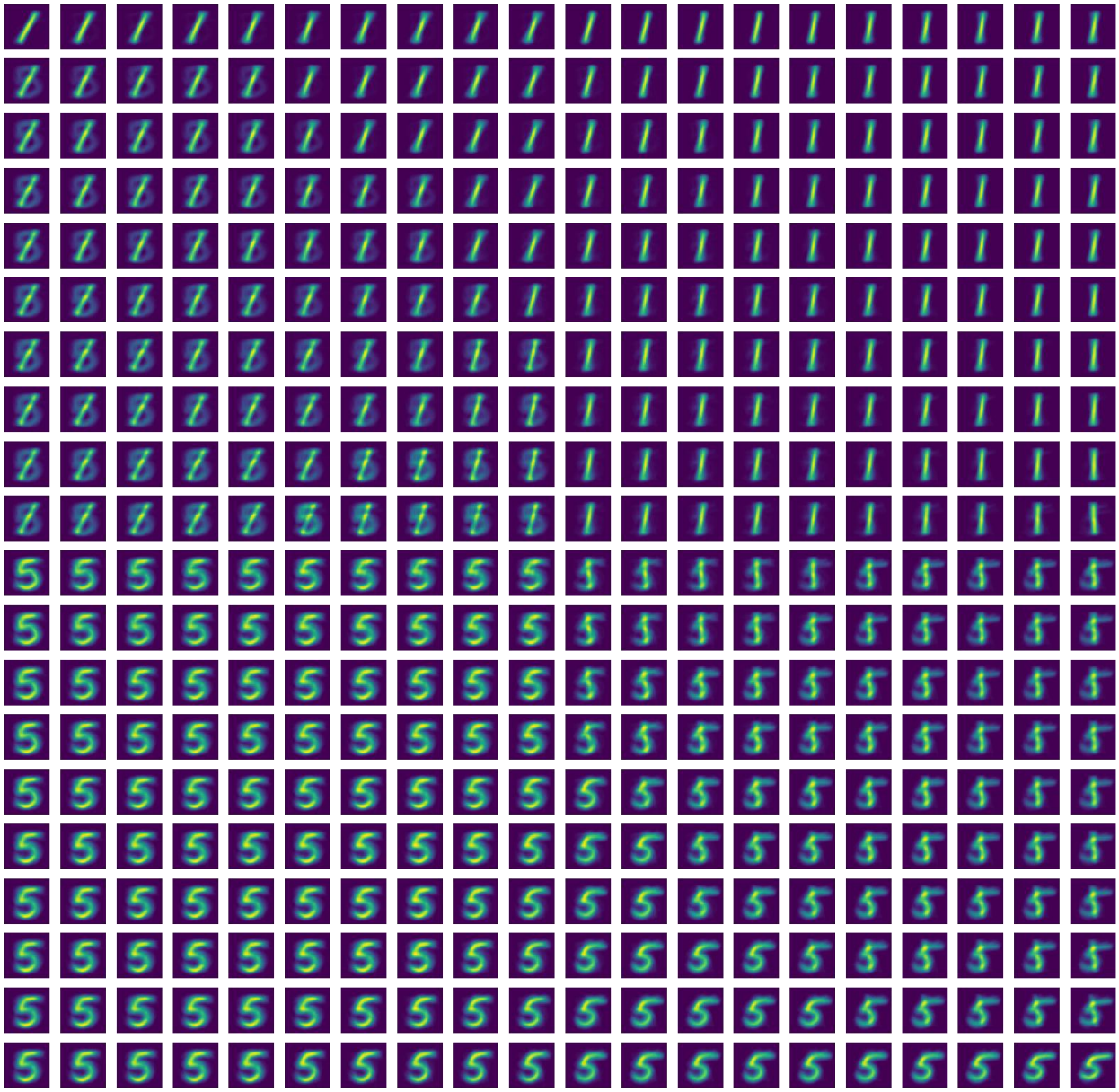


50 neurons

3.

a. We used a learning rate of 0.02. For the dimension of the SOM, we calculated it by using the formula $5 * \sqrt{size\ of\ training\ set}$ which gives the number of weights in the map then we took the square root of that result in order to get the value of the dimension for an n X n map. For the example shown in b), we used a training set size of 6,000 which give a map of size 20 X 20.

b. 2D plot of the SOM solutions for the images ‘1’ and ‘5’.



2D plot of the K-Mean solutions for the images ‘1’ and ‘5’. Each dot on the plot is an image corresponding to either a ‘1’ or a ‘5’.