s1705544

Learning Report 1

Task 1.1

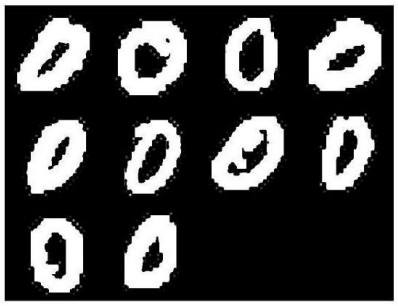

Figure 1.1.1: Class 1

Figure 1.1.2: Class 2

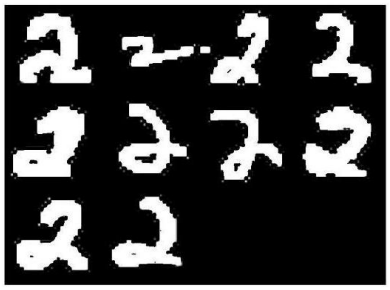

Figure 1.1.3: Class 3

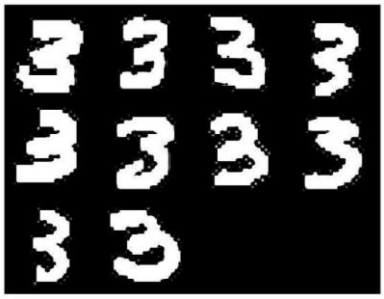

Figure 1.1.4: Class 4

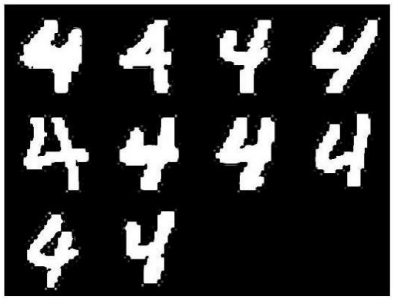

Figure 1.1.5: Class 5

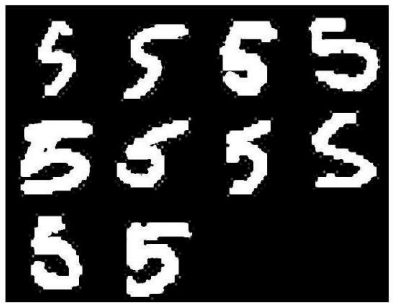

Figure 1.1.6: Class 6

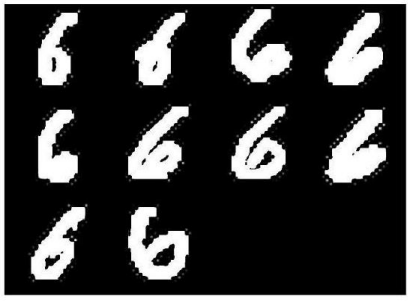

Figure 1.1.7: Class 7

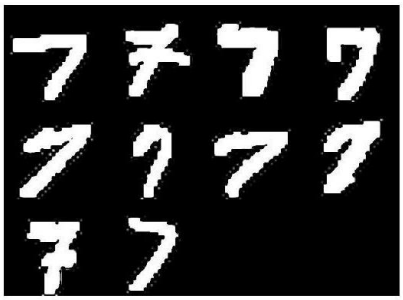

Figure 1.1.8: Class 8

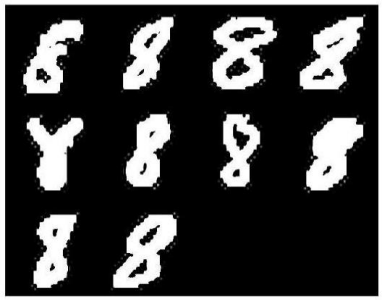

Figure 1.1.9: Class 9

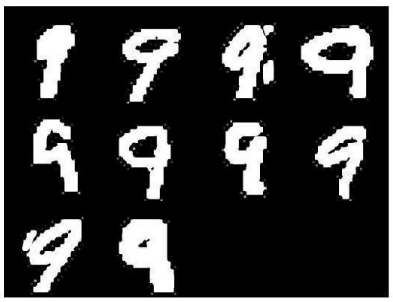

Figure 1.1.10: Class 10

Task 1.2

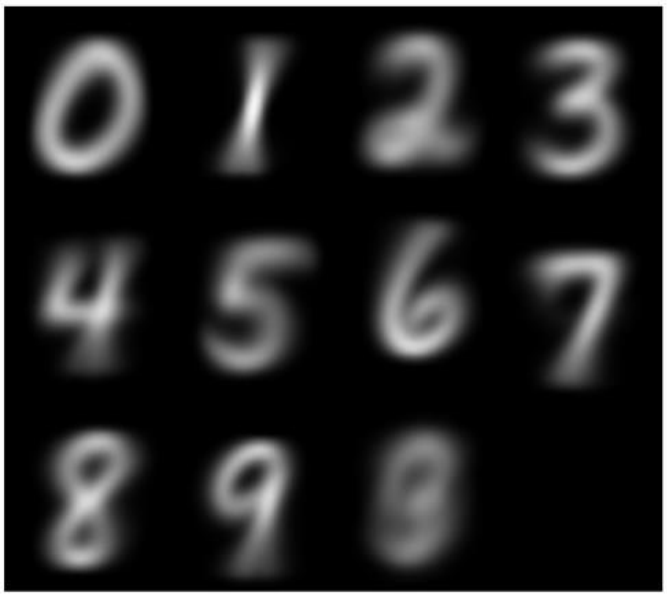

Figure 1.2.1: Images of the mean vectors for Class 1 to Class 10.

Task 1.3

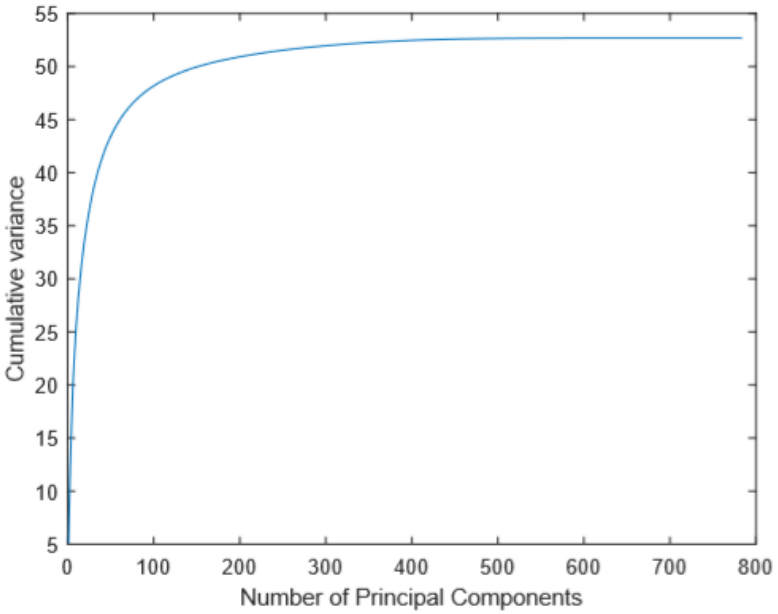

Figure 1.3.1: Cumulative Variance

Commutative Variance: The covariance is commutative. Cov(X,Y) = Cov(Y,X).

PCA dimensions cover	Minimum Dimensions
70%	27
80%	44
90%	88
95%	154

Figure 1.3.2: Minimum Dimensions

Task 1.4

Figure 1.4.1: Images of first ten principal components.

Task 1.5

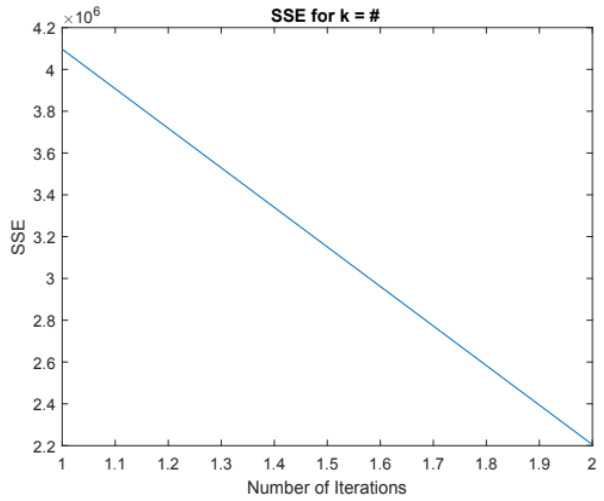

Figure 1.5.1: k = 1

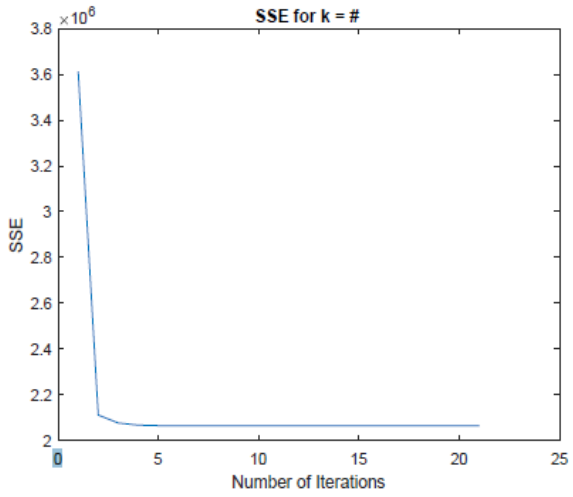

Figure 1.5.2: k = 2.

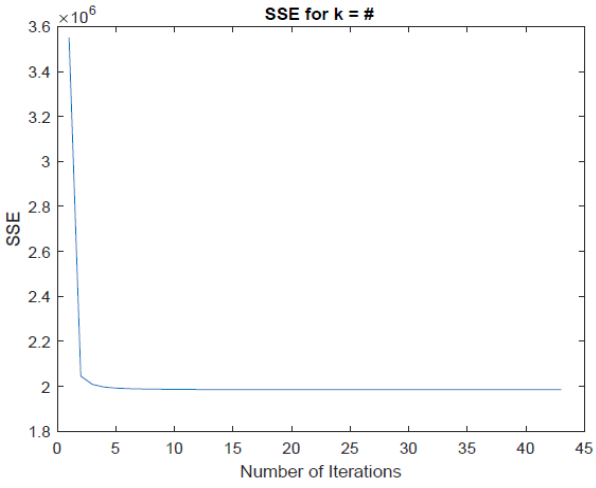

Figure 1.5.3: k = 3.

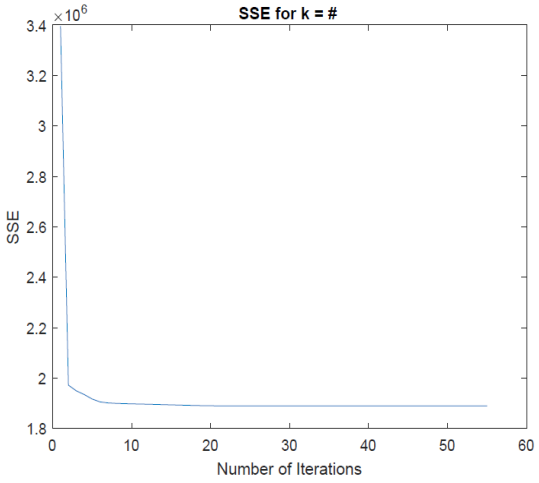

Figure 1.5.4: k = 4.

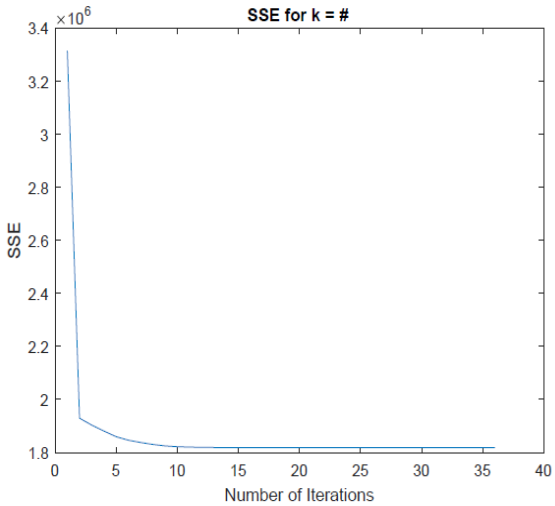

Figure 1.5.5: k = 5.

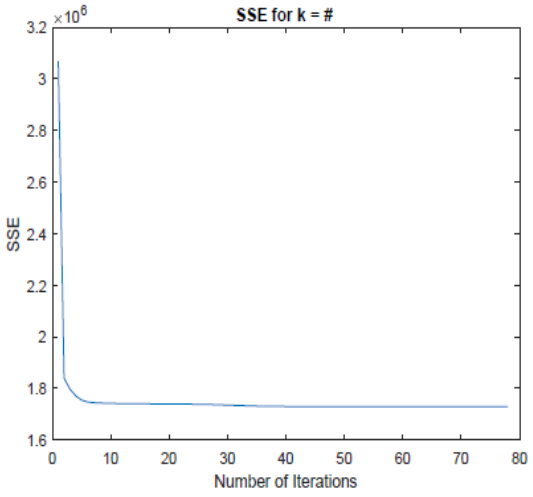

Figure 1.5.6: k = 7.

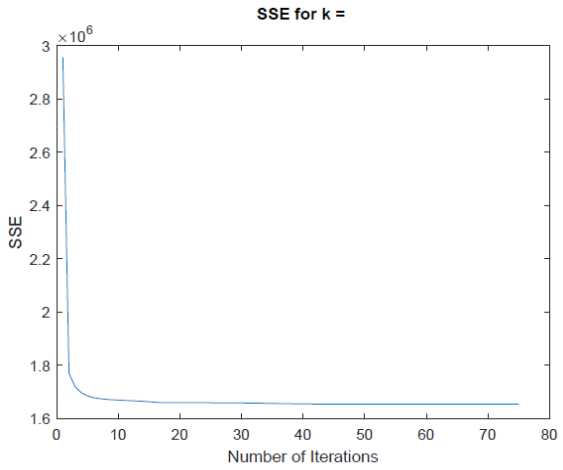

Figure 1.5.10: k = 10.

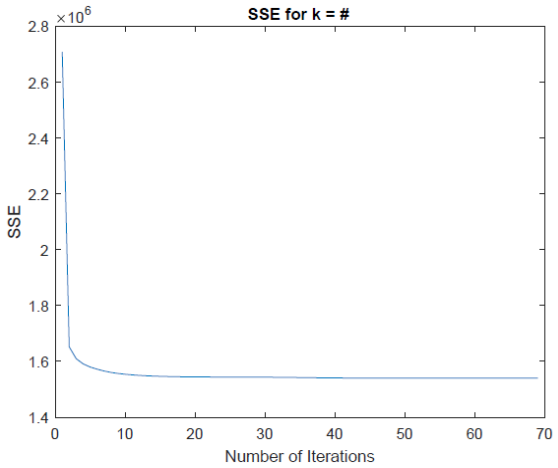

Figure 1.5.15: k = 15.

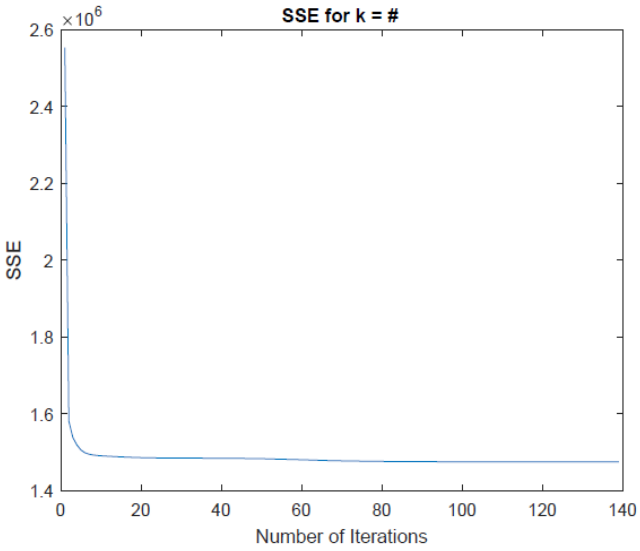

Figure 1.5.7: k = 20

```
>> main
k = 1 at 9.554877e-01 seconds.
k = 2 at 1.359764e+01 seconds.
k = 3 at 2.913961e+01 seconds.
k = 4 at 3.846596e+01 seconds.
k = 5 at 2.730132e+01 seconds.
k = 7 at 6.201623e+01 seconds.
k = 10 at 6.372000e+01 seconds.
k = 15 at 6.514990e+01 seconds.
k = 20 at 1.414235e+02 seconds.
```

Figure 1.5.8: Time taken for each k.

Task 1.6

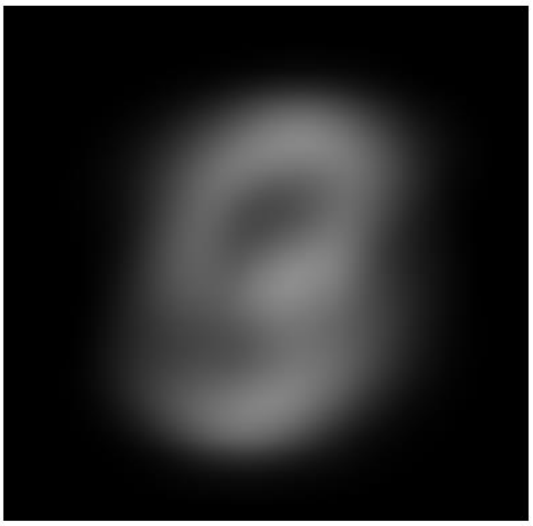

Figure 1.6.1: Image of cluster centres for k = 1

Figure 1.6.2: Image of cluster centres for k = 2

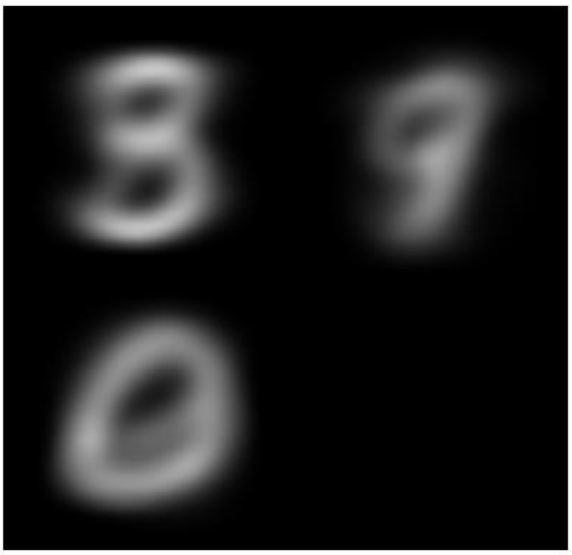

Figure 1.6.3: Image of cluster centres for k = 3

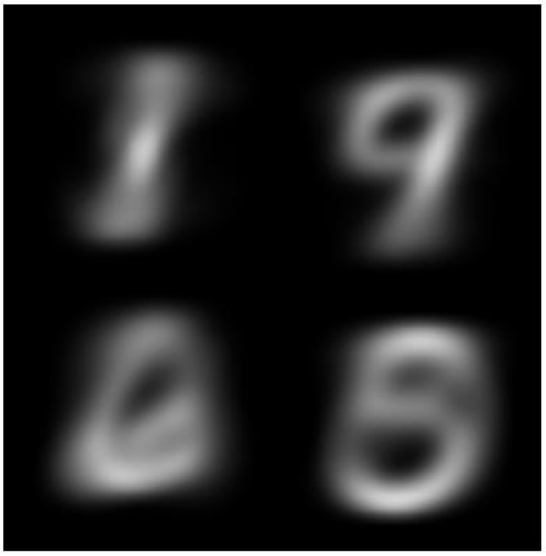

Figure 1.6.4: Image of cluster centres for k = 4

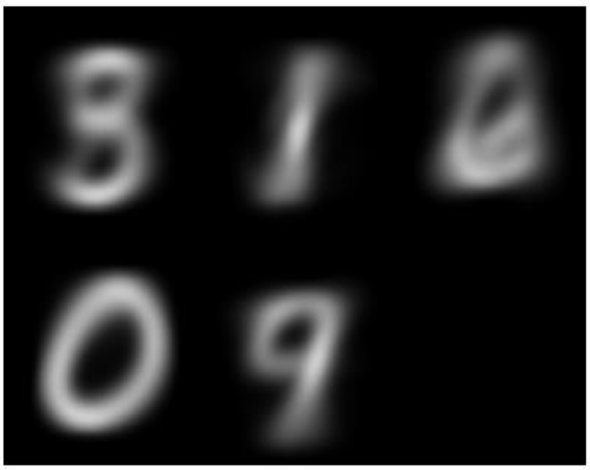

Figure 1.6.5: Image of cluster centres for k = 5

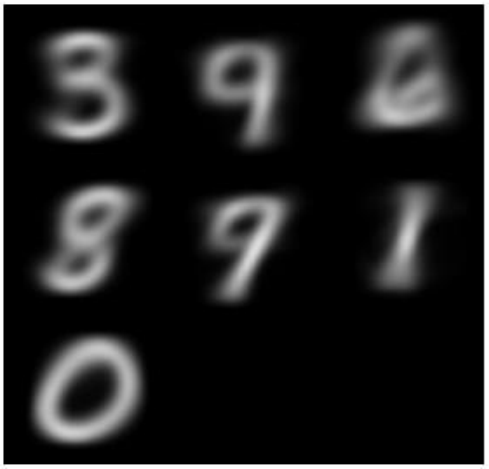

Figure 1.6.6: Image of cluster centres for k = 7

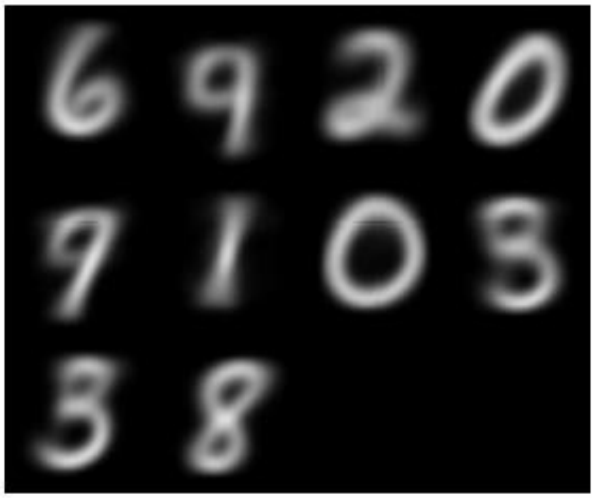

Figure 1.6.7: Image of cluster centres for k = 10

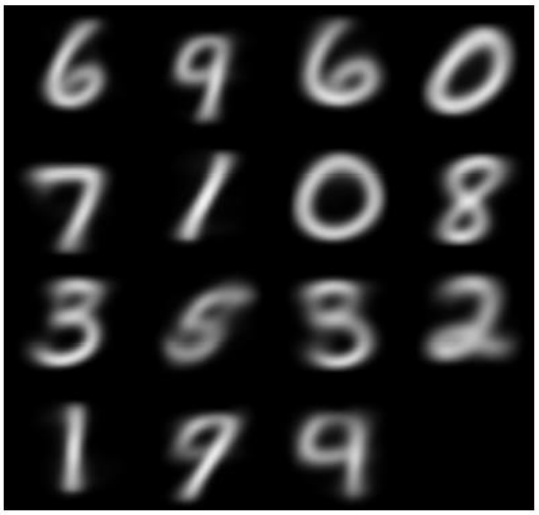

Figure 1.6.8: Image of cluster centres for k = 15

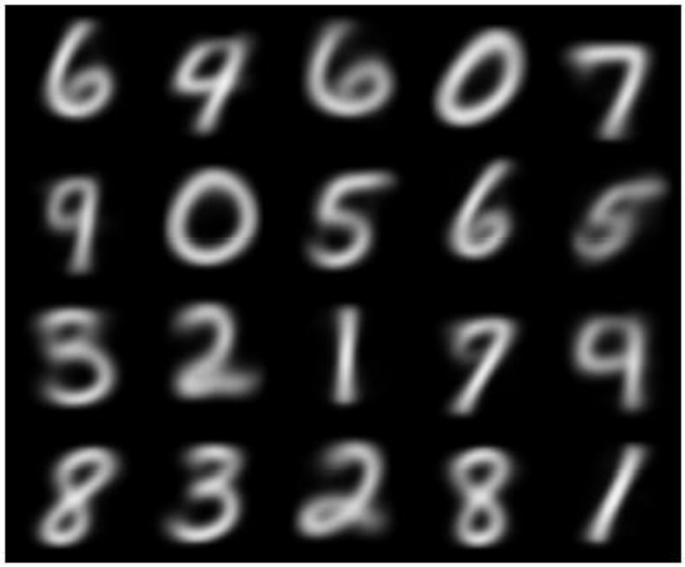

Figure 1.6.9: Image of cluster centres for k = 20

Task 1.7

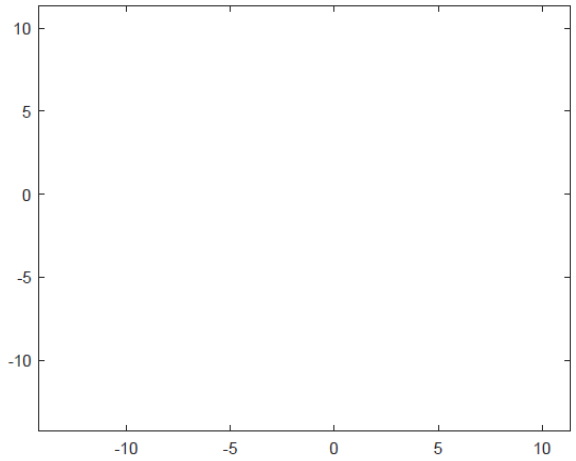

Figure 1.7.1: Cross-section image of cluster regions for k = 1.

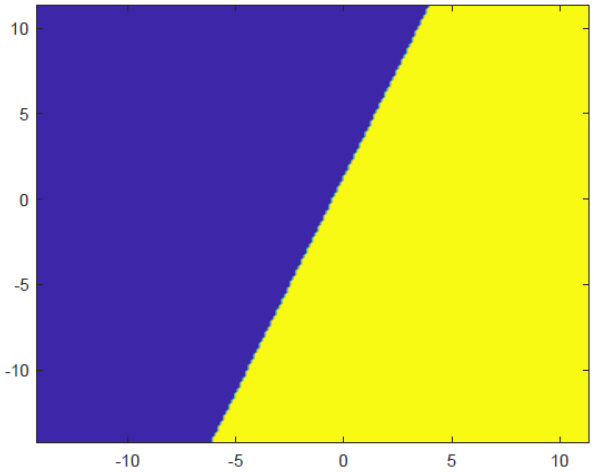

Figure 1.7.2: Cross-section image of cluster regions for k = 2.

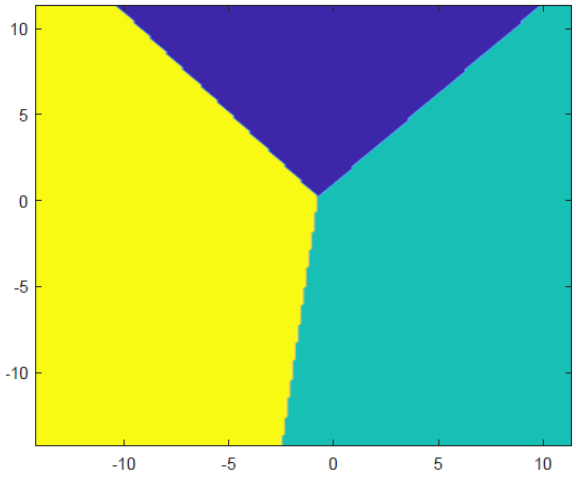

Figure 1.7.3: Cross-section image of cluster regions for k = 3.

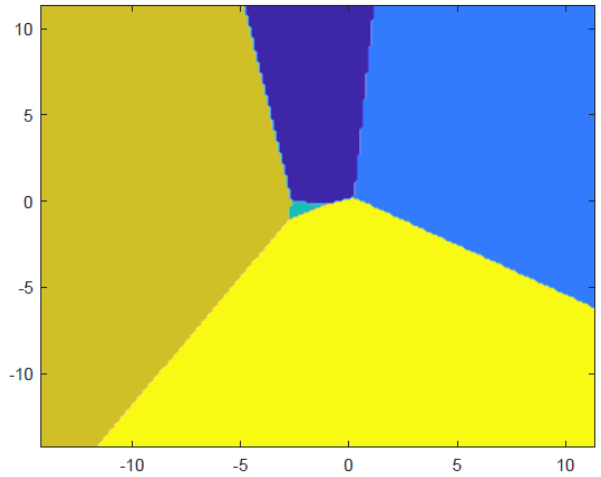

Figure 1.7.4: Cross-section image of cluster regions for k = 5.

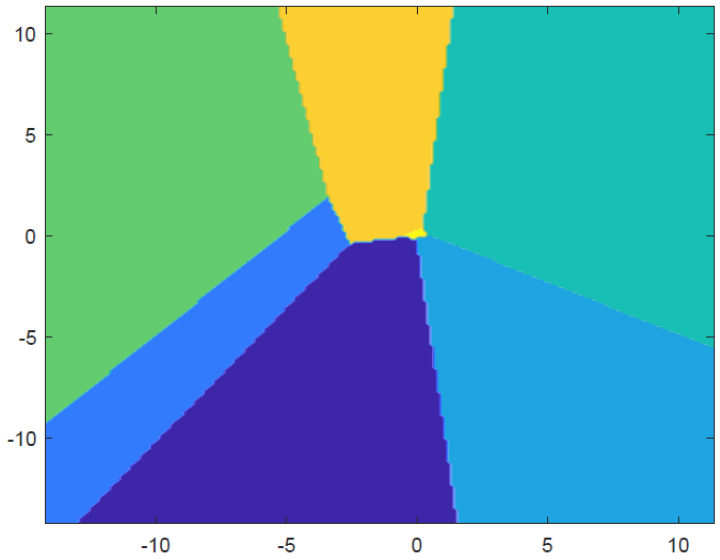

Figure 1.7.5: Cross-section image of cluster regions for k = 10.

s1705544

Task 1.8

Topic: The research project that I will conduct will be focused on random initial clusters. The aim is to evaluate if the initial centres generated impacts the number of iterations required to find the clusters.

Methods: I used 3 random initial centres generated randomly, with k = 3, 5 and 7, to analyse their performances. I initially generated random cluster centres. With the training data set, I increment k choosing random cluster centres. This will show what happens to the value of SSE. Which is the sum-squared error function to measure the quality of a K-means clustering solution. I ran my experiment for k = 3, 5 and 7.