**50.007 Machine Learning HW2**

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Q1.1 a) F

b) T

c) F

d) F

e) T

Q1.2 a) µ1 = = 7.5

b) µ2 = = 6

c) Since the two centroids are 6 and 7.5, all points less than 6 will be clustered to D2 and all points more than 7.5 will be clustered to D1.

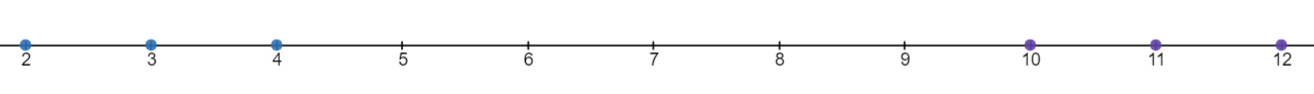
D1 = {10, 11, 12}

D2 = {2, 3, 4}

d) Centroid of D1 =

Centroid of D2  =

e) The clustering is stable. The optimal solution is one where each cluster has minimal variance. The variance of both D clusters is 0.667, which is much lower compared to the variance C1 = 16.25 and C2 = 16. This is the lowest possible variance for the clusters given that the data are all different integer values. Calculating the new centroids of this cluster would also yield the same results. Furthermore, considering the values of the data points, it is also easy to visually cluster them by plotting the points on a number line as shown below.



Q2.1 a)

b)

Q2.2 a)



b) A soft margin is preferable when data is not linearly separable. This allows a degree of misclassification which would prevent overfitting of the data.

Q2.3 See attached script svmtest.py for code.

The best kernel is the Radial Basis Function kernel with an accuracy of 87.3%.

Text

Description automatically generated