Jeremy Yang

ADS Assignment 8

1. K-Means: 2D points $(x, y) \in$ (2,5), (1,5), (22,55), (42,12), (15,16)
   i 1 2 3 4 5

   Cluster for $K=2$

   Step 1: Init centroids randomly: $\mu_1 = (17, 43)$ $\mu_2 = (36, 6)$

   Iteration 1:

   a) Assign cluster by closest centroid

$$c^{(1)} = \arg\min_j \left(15^2+38^2,\ 34^2+1^2\right) = 2$$

$$c^{(2)} = \arg\min_j \left(16^2+38^2,\ 35^2+1^2\right) = 2$$

$$c^{(3)} = \arg\min_j \left(5^2+12^2,\ 14^2+49^2\right) = 1$$

$$c^{(4)} = \arg\min_j \left(25^2+31^2,\ 6^2+6^2\right) = 2$$

$$c^{(5)} = \arg\min_j \left(2^2+27^2,\ 21^2+10^2\right) = 1$$

   b) Move centroids

$$\mu_1 = (22, 55)$$

$$\mu_2 = \left(\frac{2+1+42+15}{4},\ \frac{5+5+12+16}{4}\right) = (15, 9.5)$$

Iteration 2:

$$c^{(1)} = \arg\min_j \left(20^2+50^2,\ 13^2+4.5^2\right) = 2$$

$$c^{(2)} = \arg\min_j \left(21^2+50^2,\ 14^2+4.5^2\right) = 2$$

$$c^{(3)} = \arg\min_j \left(0+0,\ 40^2+45.5^2\right) = 1$$

$$c^{(4)} = \arg\min_j \left(20^2+43^2,\ 27^2+2.5^2\right) = 2$$

$$c^{(5)} = \arg\min_j \left(7^2+39^2,\ 0+6.5^2\right) = 2$$

converged!