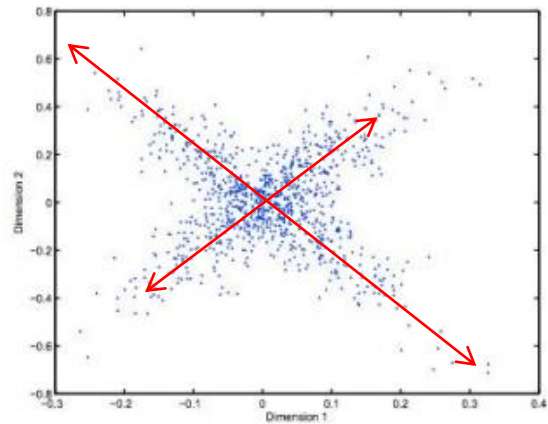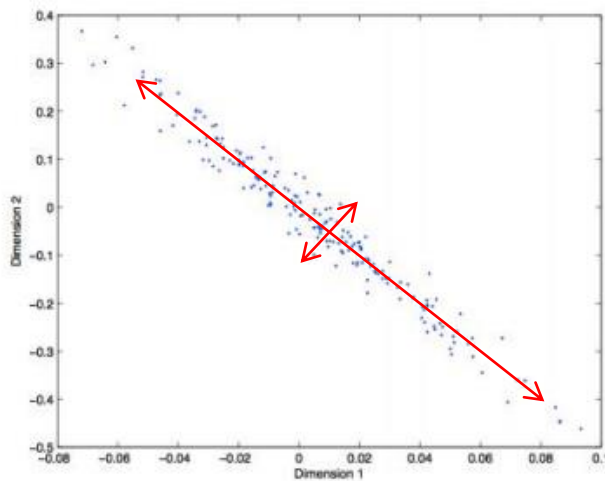José Tristani
jtristani3

CS-7641 Problem Set 2:

3. Plot the direction of the first and second PCA components in the figures given.

4. Which clustering method(s) is most likely to produce the following results at k = 2? Choose the most likely method(s) and briefly explain why it/they will work better where others will not in at most 3 sentences. Here are the five clustering methods you can choose from:
   - Hierarchical clustering with single link
   - Hierarchical clustering with complete link
   - Hierarchical clustering with average link
   - K-means
   - EM

   a. Hierarchical clustering with single link would be the best choice, EM could arrive at the same clustering as well. The others hierarchical types won't work well because of the cluster distances.
   b. K-means and EM would correctly label these. The other Hierarchical clustering types will label the centers the same, where k-means and EM wont.
   c. The only method capable of overlapping clusters like these is EM.

7. Consider the following simple grid-world problem. (Actions are N, S, E, W and are deterministic.) Our goal is to maximize the following reward:
   - 10 for the transition from state 6 to G
   - 10 for the transition from state 8 to G
   - 0 for all other transitions

a. Draw the Markov Decision Process
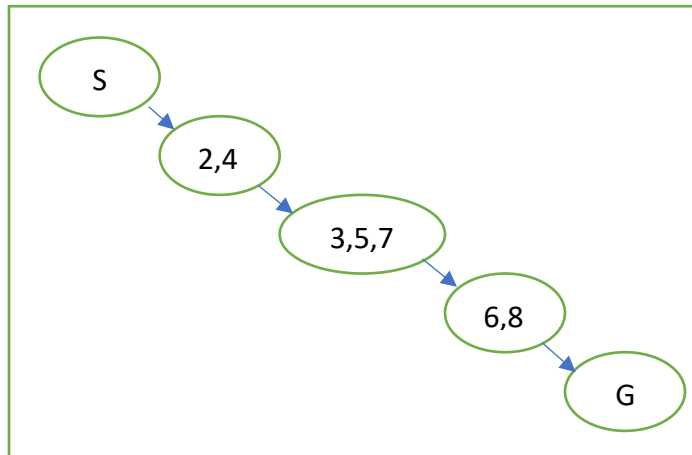
b. Compute the value function for each state for iteration 0, 1, 2 and 3 with $\gamma=0.8$

1st iteration		
0	0	0
0	0	8
0	8	10

2nd iteration		
0	0	6.4
0	6.4	8
6.4	8	10

3rd iteration		
0	5.12	6.4
5.12	6.4	8
6.4	8	10

8. Find a Nash Equilibrium in each case. The rows denote strategies for Player 1 and columns denote strategies for Player 2.

a. AA and BB are Nash equilibriums, neither player can choose a better action to increase their reward.

b. There is no Nash equilibrium given that each player can chose the opposing action to increase their reward in all scenarios.

c. TL and BR are Nash Equilibriums, neither player can choose a better action to increase their reward.