

# Quiz

## Unsupervised Learning

1. For which of the following tasks might K-means clustering be a suitable algorithm? Select all that apply.

1 / 1 point

- ☒ Given a database of information about your users, automatically group them into different market segments.

✓ **Correct**

You can use K-means to cluster the database entries, and each cluster will correspond to a different market segment.

- ☒ Given sales data from a large number of products in a supermarket, figure out which products tend to form coherent groups (say are frequently purchased together) and thus should be put on the same shelf.

✓ **Correct**

If you cluster the sales data with K-means, each cluster should correspond to coherent groups of items.

- ☐ Given historical weather records, predict the amount of rainfall tomorrow (this would be a real-valued output)
- ☐ Given sales data from a large number of products in a supermarket, estimate future sales for each of these products.

2. Suppose we have three cluster centroids  $\mu_1 = \begin{bmatrix} 1 \\ 2 \end{bmatrix}$ ,  $\mu_2 = \begin{bmatrix} -3 \\ 0 \end{bmatrix}$  and  $\mu_3 = \begin{bmatrix} 4 \\ 2 \end{bmatrix}$ . Furthermore, we have a training example  $x^{(i)} = \begin{bmatrix} 3 \\ 1 \end{bmatrix}$ . After a cluster assignment step, what will  $c^{(i)}$  be?

1 / 1 point

- ☐  $c^{(i)} = 1$
- ☒  $c^{(i)} = 3$
- ☐  $c^{(i)}$  is not assigned
- ☐  $c^{(i)} = 2$

✓ **Correct**

$x^{(i)}$  is closest to  $\mu_3$ , so  $c^{(i)} = 3$

3. K-means is an iterative algorithm, and two of the following steps are repeatedly carried out in its inner-loop. Which two?

1 / 1 point

- ☐ Feature scaling, to ensure each feature is on a comparable scale to the others.
- ☒ The cluster assignment step, where the parameters  $c^{(i)}$  are updated.

✓ **Correct**

This is the correct first step of the K-means loop.

- ☐ Using the elbow method to choose K.
- ☒ Move the cluster centroids, where the centroids  $\mu_k$  are updated.

✓ **Correct**

The cluster update is the second step of the K-means loop.

4. Suppose you have an unlabeled dataset  $\{x^{(1)}, \dots, x^{(m)}\}$ . You run K-means with 50 different random initializations, and obtain 50 different clusterings of the data. What is the recommended way for choosing which one of these 50 clusterings to use?

1 / 1 point

- ☐ Manually examine the clusterings, and pick the best one.
- ☐ Plot the data and the cluster centroids, and pick the clustering that gives the most "coherent" cluster centroids.
- ☐ Use the elbow method.
- ☒ Compute the distortion function  $J(c^{(1)}, \dots, c^{(m)}, \mu_1, \dots, \mu_k)$ , and pick the one that minimizes this.

✓ **Correct**

A lower value for the distortion function implies a better clustering, so you should choose the clustering with the smallest value for the distortion function.

5. Which of the following statements are true? Select all that apply.

1 / 1 point

- ☐ Since K-Means is an unsupervised learning algorithm, it cannot overfit the data, and thus it is always better to have as large a number of clusters as is computationally feasible.
- ☐ The standard way of initializing K-means is setting  $\mu_1 = \dots = \mu_k$  to be equal to a vector of zeros.
- ☒ If we are worried about K-means getting stuck in bad local optima, one way to ameliorate (reduce) this problem is if we try using multiple random initializations.

✓ **Correct**

Since each run of K-means is independent, multiple runs can find different optima, and some should avoid bad local optima.

- ☒ For some datasets, the "right" or "correct" value of K (the number of clusters) can be ambiguous, and hard even for a human expert looking carefully at the data to decide.

✓ **Correct**

In many datasets, different choices of K will give different clusterings which appear quite reasonable. With no labels on the data, we cannot say one is better than the other.