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

- [x] 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.

- [x] 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**

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

Correct
$x^{(i)}$ is closest to μ_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**

- [x] Move the cluster centroids, where the centroids μ_k are updated.

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

- [ ] Randomly initialize the cluster centroids.

- [x] The cluster assignment step, where the parameters $c^{(i)}$ are updated.

Correct
This is the correst first step of the K-means loop.

- [ ] Test on the cross-validation set.

4. Suppose you have an unlabeled dataset $\{x^{(1)}, \ldots, x^{(m)}\}$. 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 $J(c^{(1)}, \ldots, c^{(m)}, \mu_1, \ldots, \mu_k)$, 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**

- [ ] The standard way of initializing K-means is setting $\mu_1 = \cdots = \mu_k$ to be equal to a vector of zeros.
- [x] 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.

- [x] 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.

- [ ] 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.