

1.4 K-means Clustering

K-means clustering aims to partition an unlabeled dataset into clusters. The algorithm is easy:

- Randomly initialize k cluster centroids $\mu_1, \mu_2, \dots, \mu_k$.
- Repeat:
 - **Cluster assignment.** Assign each data point to its closest centroid.
 - **Move centroid.** Move each centroid to the average of the points assigned to it.

Essentially, it finds $\mu_1, \mu_2, \dots, \mu_k$ that minimizes

$$J(\mu_1, \mu_2, \dots, \mu_k) = \frac{1}{m} \sum_{i=1}^m \|x^{(i)} - \mu_{c^{(i)}}\|^2. \quad (7)$$

Typically, you can initialize the centroids as some subset of your training data. Because you might find a local optima with some unlucky random initialization, you can run k -means 50-1000 times and pick the one with the lowest cost. To choose the number of clusters k , you can do it manually using the "elbow method" (lol). More importantly, you should consider the downstream purpose that you're using the clusters for.