Lecture 7.(a) K-means.

- Unsupervised learning:

(1) training set: $\{x_1, x_2 \cdots x_m\}$ no label y_i

(2) k-means clustering:

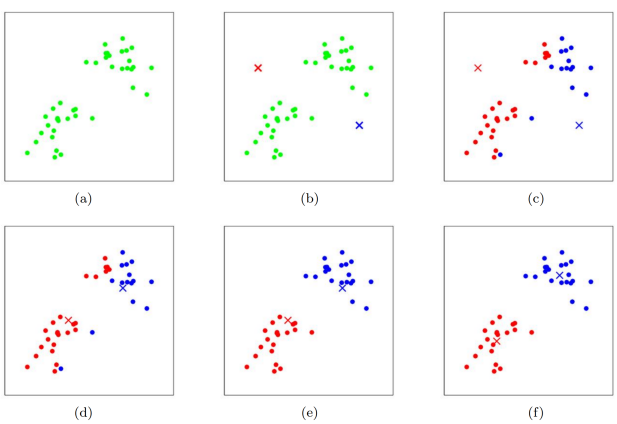
① initialize cluster centroid $\mu_1, \mu_2 \cdots \mu_k$.

② repeat:

i: $c_i = \arg\min_j \|x_i - \mu_j\|^2$ (min distance)

j: $\mu_j = \dfrac{\sum_{i=1}^{m} 1(c_i = j)\, x_i}{\sum_{i=1}^{m} 1(c_i = j)}$

*: assign x_i to closest centroid → reestimate



(3) Convergence:

distortion function:

$J(c, \mu) = \sum_{i=1}^{m} \|x_i - \mu_{c_i}\|^2$ (non-convex → local minima)

*: minimize $J(c, \mu)$! (run several times)