1 K-means clustering

Given N data points $\{x_n\}_{n=1}^N \subset \mathbb{R}^D$. Initialize K prototype vectors $\{\mu_k\}_{k=1}^K$. Each μ_k corresponds to the mean of the k^{th} cluster. Let r_{nk} be indicator variable with respect to x_n and μ_k.

$$r_{nk} = \begin{cases} 1 & \text{if } k = \arg\min \|x_n - \mu_k\|^2 \\ 0 & \text{otherwise} \end{cases}$$

Then update μ_k,

$$\mu_k = \frac{\sum_n r_{nk} x_n}{\sum_n r_{nk}}$$

Keep this procedure until

$$J = \sum_{n=1}^{N} \sum_{k=1}^{K} r_{nk} \|x_n - \mu_k\|^2$$

converge.