K-Means from EM perspective

M-step

$$\theta^{k+1} = \arg\max_{\theta} \mathbb{E}_{q^{k+1}} \log p(X, T \mid \theta)$$

$$\mu_c^{k+1} = \frac{\sum_{i:c_i=c} x_i}{\#\{i : c_i = c\}}$$

K-Means from EM perspective

M-step

$$\theta^{k+1} = \arg\max_{\theta} \mathbb{E}_{q^{k+1}} \log p(X, T \mid \theta)$$

$$\mu_c^{k+1} = \frac{\sum_{i:c_i=c} x_i}{\#\{i : c_i = c\}}$$

Exactly like in K-Means!

K-Means from EM perspective

Summary

K-Means is actually EM for Gaussian Mixture Model, but

- With fixed covariance matrices $\Sigma_c = I$
- Simplified E-step (approximate $p(t_i \mid x_i, \theta)$ with delta function)

Thus K-Means is faster but less flexible than GMM