Expectation maximisation

Ex 1

$$\underset{\mu Z}{\operatorname{argmin}}\ R(\mu, Z, X) = \underset{\mu Z}{\operatorname{argmin}} \|X - Z\mu\|_2^2$$

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$$\sum_{n=1}^{N} \sum_{k=1}^{K} \|X_n - Z_{nk}\mu_k\|_2^2$$

$$\sum_{k=1}^{K} Z_{nk}\mu_k$$

$$\sum_{n=1}^{N} \|x_n - \sum_{k=1}^{K} Z_{nk}\mu_k\| - (K-1)\sum_{n=1}^{N} \|x_n\|_2^2$$

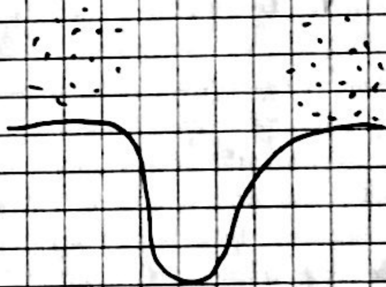
$$= \|X - Z\mu\|_2^2$$

Ex 2

$$P(x_n \mid \mu_i, \Sigma_i) = \mathcal{N}(x_n \mid x_n \sigma_n^2 I)$$

$$= \frac{1}{(\sqrt{2\pi})^d |\Sigma_k|^{1/2}} e\left(-\frac{1}{2}(x_n - x_n)^T \Sigma_k^{-1}(x_n - x_n)\right)$$

$$= \frac{1}{(\sqrt{2\pi})^d} \frac{1}{(\sigma_n)^d} \Rightarrow$$



$$\max_{\alpha} \left[\sum_{n=1}^{N} a_n - \frac{1}{2} \sum_{n,m}^{N} a_m a_n t_m t_n x_m^T x_n \right]$$

$$\sum_{n=1}^{N} a_n - \frac{1}{2} \sum_{n,m=1}^{N} a_m a_n t_m t_n x_m^T x_n$$

$$N - \frac{1}{2} \sum_{n,m}^{N} a_m t_m t_n x_m^T x_n = 0$$

$$N = \frac{1}{2} \sum_{n,m}^{4} a_m t_m t_n x_m^T x_n$$

$$\frac{\partial \mathcal{J}}{\partial w} = w - \sum_{n=1}^{N} \lambda_n t_n x_n = 0$$

$$w = \sum_{n=1}^{N} \lambda_n t_n x_n$$

$$\frac{\partial \mathcal{J}}{\partial b} = - \sum_{n=1}^{N} \lambda_n t_n = 0$$

$$\frac{\partial \mathcal{J}}{\partial \lambda_n} = \sum_{n=1}^{N} t_n w^T x_n + t_n b - 1 = 0$$

$$\sum_{n=1}^{N} t_n w^T x_n + t_n b = N$$

$$\sum^{N}$$

$$b = t_n - \sum_{m=1}^{N} a_m t_m x_m^T x_n$$

$$\sum_{n=1}^{N} a_n - \frac{1}{2} \sum a_m a_n t_m t_n x_m^T x_n$$

$4w_1 >$