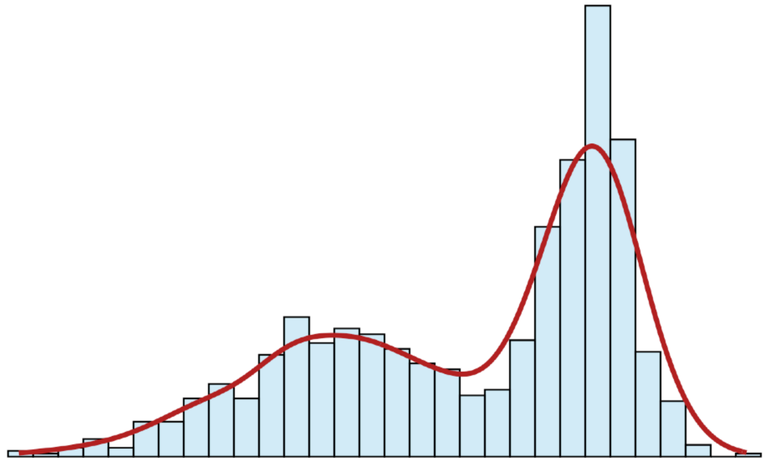
Posterior Probabilities

$$p(x) = w_k \, \mathcal{N}(x \mid \mu_k, \Sigma_k)$$



prior probability of being in group k

likelihood of seeing x in group k

$$p(\text{cluster } k \mid x) = \frac{w_k \, \mathcal{N}(x \mid \mu_k, \Sigma_k)}{\sum_{j=1}^{K} w_j \, \mathcal{N}(x \mid \mu_j, \Sigma_j)}$$

posterior probability of being in cluster k

MaximumLikelihood Estimation

$$p(x) = \sum_{k=1}^{K} w_k \, \mathcal{N}(x \mid \mu_k, \Sigma_k)$$

$$p(\mathbf{X} \mid \mathbf{w}, \mu, \mathbf{\Sigma}) = p(x_1, x_2, \ldots, x_n \mid \mathbf{w}, \mu, \mathbf{\Sigma}) = \prod_{n=1}^{N} \sum_{k=1}^{K} w_k \mathcal{N}(x_n \mid \mu_k, \Sigma_k)$$

$$\log p(\mathbf{X} \mid \mathbf{w}, \mu, \mathbf{\Sigma}) = \sum_{n=1}^{N} \log \left[\sum_{k=1}^{K} w_k \mathcal{N}(x_n \mid \mu_k, \Sigma_k) \right]$$

Goal: choose w, μ, Σ that maximizes the log likelihood