Estimating the mixing proportions π

To estimate the mixing proportions, we can use a maximum likelihood approach

$$\hat{\pi}_{\text{MLE}} = \underset{\pi}{\text{argmax}}\, \mathcal{L}(\pi)$$

$$\text{where} \qquad \mathcal{L}(\pi) = \sum_{i=1}^{n} \log \left(\sum_{j=1}^{m} \pi_j f_j(x_i, y_i) \right)$$

Unfortunately the standard MLE procedure for estimating π is intractable with this likelihood.

The Expectation Maximization (EM) algorithm provides an alternative way to estimate $\hat{\pi}_{\text{MLE}}$