Gaussian application to derivation

$$p(\vec{y}) = \sum_{i=1}^{M} \alpha_i p_i(\vec{y}_j | \vec{\mu}_i, \mathbf{\Sigma}_i)$$

$$\vec{\theta} = \{\alpha_1, ..., \alpha_M, \vec{\mu}_1, ..., \vec{\mu}_M, \mathbf{\Sigma}_1, .., \mathbf{\Sigma}\}$$

E - Step

$$a_{ij}^{p} = \frac{\alpha_j^p p(\vec{y}_i^{(p)} | \vec{\mu}_j^{(p)} \mathbf{\Sigma}_j^{(p)})}{\sum_{j=1}^{M} \alpha_j^p p(\vec{y}_i^{(p)} | \vec{\mu}_j^{(p)} \mathbf{\Sigma}_j^{(p)})}$$

M-Step

$$\vec{\mu}_j^{(p+1)} = \frac{\sum_{i=1}^{N} a_{ij}^{p} \vec{y}_i}{\sum_{i=1}^{N} a_{ij}^{(p)}}$$

$$\mathbf{\Sigma}_j^{(p+1)} = \frac{\sum_{i=1}^{N} a_{ij} (\vec{y}i - \vec{\mu}_j)(\vec{y}i - \vec{\mu}_j)^T}{\sum_{i=1}^{N} a_{ij}^{(p)}}$$

$$\alpha_j^{(p+1)} = |a_j|$$