$$\begin{pmatrix} a_1 \\ a_2 \\ \vdots \\ a_i \\ \vdots \\ a_n \end{pmatrix} + \begin{pmatrix} b_1 \\ b_2 \\ \vdots \\ b_i \\ \vdots \\ b_n \end{pmatrix} = \begin{pmatrix} c_1 \\ c_2 \\ \vdots \\ c_i \\ \vdots \\ c_n \end{pmatrix}$$

$$\sum_{i=1}^{N} a_i = ?$$

$$\begin{pmatrix} a_{11} & a_{12} & \cdots & a_{1n} \\ a_{21} & a_{22} & & \\ \vdots & & \ddots & \\ a_{n1} & & & a_{nn} \end{pmatrix} \times \begin{pmatrix} b_{11} & b_{12} & \cdots & b_{1n} \\ b_{21} & b_{22} & & \\ \vdots & & \ddots & \\ b_{n1} & & & b_{nn} \end{pmatrix}$$

$$= \begin{pmatrix} c_{11} & c_{11} & \cdots & c_{1n} \\ c_{21} & c_{22} & & \\ \vdots & & \ddots & \\ c_{n1} & & & c_{nn} \end{pmatrix}$$

$$l(\mu, \Sigma, \mathbf{x}) = \sum_{i=1}^{N} \ln \left(\sum_{k=1}^{K} \pi_k \mathcal{N}(x_i | \mu_k, \Sigma_k) \right)$$