$$
\begin{aligned}
\mathscr{L}(x_1, \ldots, x_n; \theta) &= \prod_{i=1}^{n} f_\theta(x_i) \\
&= \prod_{i=1}^{n} \sum_{j=1}^{m} f_\theta(x_i | z_i = j) p(z_i = j) \\
&= \prod_{i=1}^{n} \sum_{j=1}^{m} \alpha_j \phi(x_i, \mu_j, \Sigma_j)
\end{aligned}
$$