Let $\vec{x} = (x_1, x_2, \cdots, x_n)$ be an observed sample.

Initialize $k = 0$, $\vec{\theta}^{(0)} = \left(\pi^{(0)}, \mu_1^{(0)}, \mu_2^{(0)}, {\sigma_1^2}^{(0)}, {\sigma_2^2}^{(0)}\right)$

Epsilon = $1e^{-10}$

Convergence_flag = TRUE

While (Convergence_flag) {

E-step Compute $Q\left(\vec{\theta}|\vec{\theta}^{(k)}\right)$

$$Q\left(\vec{\theta}|\vec{\theta}^{(k)}\right) = \log \pi^{(k)} \sum_{i=1}^{n} E\left[Z_i|x_i, \theta^{(k)}\right] + \log \phi\left(x_i; \mu_1^{(k)}, (\sigma_1^2)^{(k)}\right) \sum_{i=1}^{n} E\left[Z_i|x_i, \theta^{(k)}\right] + \log\left(1 - \pi^{(k)}\right)\left(n - \sum_{i=1}^{n} E\left[Z_i|x_i, \theta^{(k)}\right]\right) + \log \phi\left(x_i; \mu_2^{(k)}, (\sigma_2^2)^{(k)}\right)\left(n - \sum_{i=1}^{n} E\left[Z_i|x_i, \theta^{(k)}\right]\right)$$

M-step Maximize $Q\left(\vec{\theta}|\vec{\theta}^{(k)}\right)$ w.r.t. $\vec{\theta}$, set $\vec{\theta}^{(k+1)}$ equal to maximizer of Q

$$\pi^{(k+1)} = \frac{\eta^{(k)}}{n} = \frac{1}{n} \sum_{i=1}^{n} E\left[Z_i|x_i, \theta^{(k)}\right]$$

$$\mu_1^{(k+1)} = \frac{1}{\eta^{(k)}} \sum_{i=1}^{n} \eta_i^{(k)} x_i$$

$$(\sigma_1^2)^{(k+1)} = \frac{1}{\eta^{(k)}} \sum_{i=1}^{n} \eta_i^{(k)} \left(x_i - \mu_1^{(k+1)}\right)^2$$

$$\mu_2^{(k+1)} = \frac{1}{n - \eta^{(k)}} \sum_{i=1}^{n} \left(1 - \eta_i^{(k)}\right) x_i$$

$$(\sigma_2^2)^{(k+1)} = \frac{1}{n - \eta^{(k)}} \sum_{i=1}^{n} \left(1 - \eta_i^{(k)}\right)\left(x_i - \mu_2^{(k+1)}\right)^2$$

Check for convergence

If $\frac{\left||\vec{\theta}^{(k)} - \vec{\theta}^{(k-1)}|\right|}{||\vec{\theta}^{(k-1)}||} <$ Epsilon {

Convergence_flag = FALSE

}

}

Return $\vec{\theta}^{(k+1)}$