

CS 409/609 HOMEWORK 3
(Due: Friday, November 11, 2011)

1. Exercise 20.9 in R&N 3rd Edition.
2. Consider the simple 1-dimensional two-component Gaussian mixture

$$p(x|\mu_1, \mu_2) = \frac{1}{3\sqrt{2\pi}} \exp\left(-\frac{1}{2}(x - \mu_1)^2\right) + \frac{2}{3\sqrt{2\pi}} \exp\left(-\frac{1}{2}(x - \mu_2)^2\right)$$

The 25 samples (0.608, -1.590, 0.235, 3.949, -2.249, 2.704, -2.473, 0.672, 0.262, 1.072, -1.773, 0.537, 3.240, 2.400, -2.499, 2.608, -3.458, 0.257, 2.569, 1.415, 1.410, -2.653, 1.396, 3.286, -0.712) were drawn from this mixture with mean $\mu_1 = -2$ and $\mu_2 = 2$. Using these 25 samples to estimate μ_1 and μ_2 by maximum likelihood principle through EM algorithm with initial values (a) $\hat{\mu}_1^{(0)} = 1$ and $\hat{\mu}_2^{(0)} = 3$; (b) $\hat{\mu}_1^{(0)} = 4$ and $\hat{\mu}_2^{(0)} = -3$; (c) $\hat{\mu}_1^{(0)} = -2$ and $\hat{\mu}_2^{(0)} = -2$; (d) $\hat{\mu}_1^{(0)} = 5$ and $\hat{\mu}_2^{(0)} = 5$. Are they the same? Please explain.

3. Exercise 15.13 in R&N 3rd Edition.
4. Exercise 15.14 in R&N 3rd Edition.
5. Exercise 15.15 in R&N 3rd Edition.