

Home Work 4: CAP 6610 Spring '07

Due Date: Apr 19th 2007

Show all steps. Be as concise as possible.

1. Code for a mixture-of-gaussians generative model in \mathbb{R}^3 , i.e., 3-dimensions, that has three clusters with prior probabilities .15, .35 and 0.50, respectively. Cluster-1 is centered at $\langle 1, 1, 1 \rangle$, Cluster-2 is centered at $\langle 4, 0, 5 \rangle$, and cluster-3 is centered at $\langle -1, -1, -1 \rangle$. The respective covariance matrices for the three clusters are:

$$\begin{bmatrix} 62 & 8 & -26 \\ 8 & 29 & -5 \\ -26 & -5 & 35 \end{bmatrix}$$

$$\begin{bmatrix} 20 & 0 & 0 \\ 0 & 29 & 0 \\ 0 & 0 & 35 \end{bmatrix}$$

$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

Generate 500 datapoints from the above model. Finally, write an Expectation Maximization algorithm to solve for the parameters of the model, and compare against the parameters of the generative model.

2. Generate 500 data points from a single gaussian generative model that corresponds to cluster-1 above. Run principal component analysis to extract all three eigen vectors and compare with the axes of the gaussian distribution of the generative model.