

Mixture models simulations

Problem 1 [EM]

- Write a 2-dimensional RNG for a Gaussian mixture model (GMM) pdf with 2 sub-populations. Use any function/sub-routine available in your language of choice.
- Implement the expectation maximization (EM) algorithm for estimating the pdf parameters of 2-D GMMs from samples.
- Compare the quality and speed your GMM-EM estimation on 300 samples of different GMM distributions (e.g. spherical vs ellipsoidal covariance, close vs well-separated subpopulations).

Problem 2 [Testing Faith]

Given a data set, which has samples of a 2-D random variable: the first dimension is duration of the geyser eruption, the second is waiting time for the next eruption. Apply your GMM-EM algorithm to fit the data to a GMM pdf.

How many EM iterations are needed for convergence? Plot a contour plot of your final GMM pdf. Overlay the contour plot with a scatterplot of the data set. How would you use the GMM pdf estimates to cluster the data?