Mixture Models

You need to install the package `mclust` *for the following exercises.*

Exercise 1 One dimensional mixture of Gaussians

1. Simulate a sample of size 1000 of a one dimensional mixture of two gaussians with respective means, variances and proportions $\mu_1 = 0$, $\mu_2 = 4$ $\sigma_1 = 1$, $\sigma_2 = \frac{1}{2}$, $\pi_1 = \frac{1}{3}$.
2. Use the kmeans algorithm to find two clusters.
3. From the kmeans output (classification) estimate the parameters of the mixture.
4. Use the `Mclust` function of the `mlust` package to estimate the parameters of the mixture:
   - try `Mclust` with modelNames="E"
   - try `Mclust` with modelNames="V"
5. Comment the diffrences between the three previons estimations.

Exercise 2 Bi-dimensional mixture

1. Load the dataset `faithful` (from the `mclust` library.
2. Plot and describe the data.
3. Run `Mclust` on the data and decribe the result:
   - The number of cluster.
   - The parameters (variance matrices, means vectors and proportions.
   - The classification.
4. Plot the output of the `Mclust` procedure and describe each of the 4 plots.
5. Run the `hclust` on the data using the Ward Criterion and compare the clustering of `hclust` and the clustering of `Mclust` for two clusters.
6. Run the `hclust` on the data using the Ward Criterion and compare the clustering of `hclust` and the clustering of `Mclust` for three clusters.
7. Comment on the results of the two previous questions.