Lab3 Report

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Rainfall

a) Normal model

A Gibbs sampler is implemented that simulates from the joint posterior and after 2500 iterations the mean and variance converges. The result can be shown in Figure 1 and Figure 2.

$$\mu|\sigma^2, x \sim N(\mu_n, \tau_n^2)$$
$$\sigma^2|\mu, x \sim Inv-\chi^2\left(v_n, \frac{v_0\sigma_0^2 + \sum_{i=1}^{n}(x_i-\mu)^2}{n+v_0}\right)$$

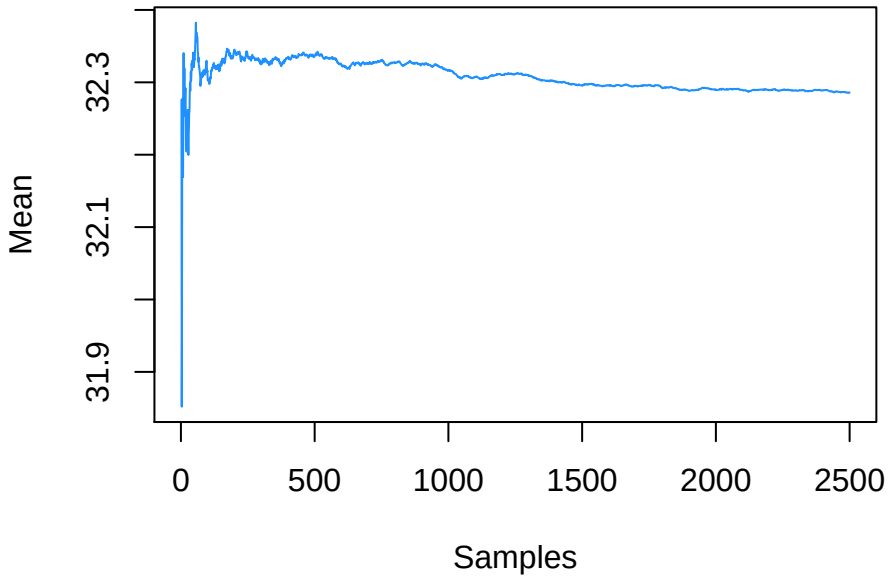

Figure 1: Convergence of the Mean

b) Mixture normal model

We use the provided code and modified it to suite our model. We updated the μ hyperparameters to:

μ_1 = mode of the density

μ_2 = mean of the data

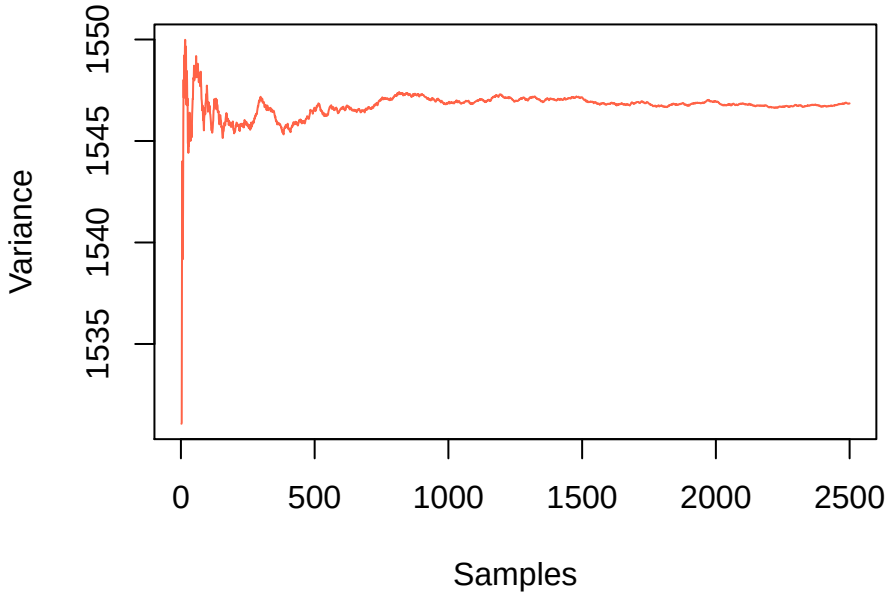

Figure 2: Convergence of the Variance

The convergence of the mean and variance can be shown in Figure 3 and Figure 4.

c)

The density from the original data together with the densities from a and b are shown in Figure 5. It is clear that the mixture model fits the data more accurately.

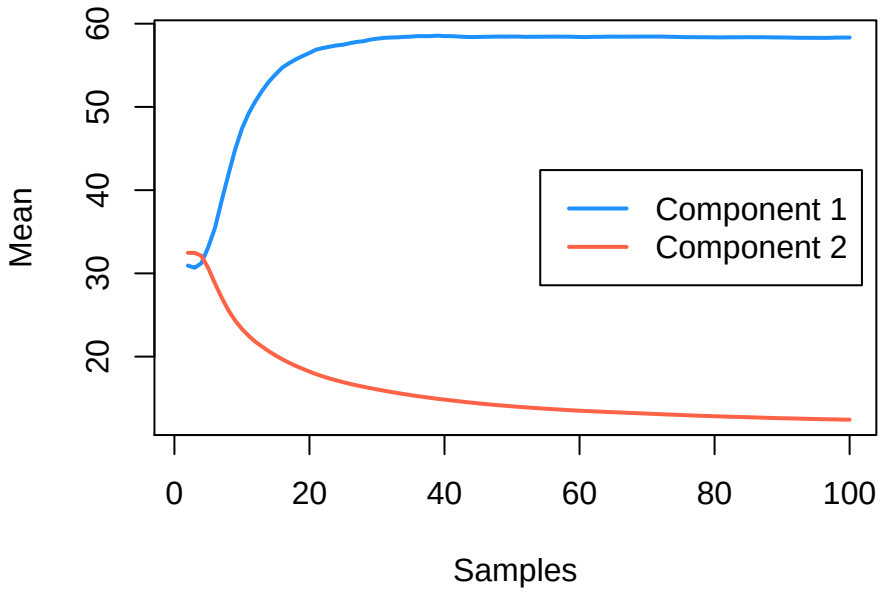

Figure 3: Convergence of the Mean

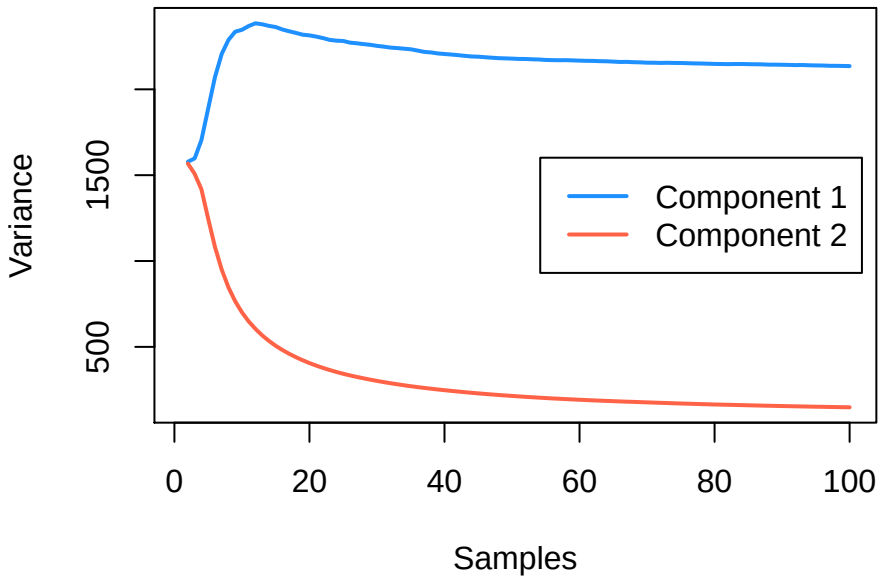

Figure 4: Convergence of the Variance

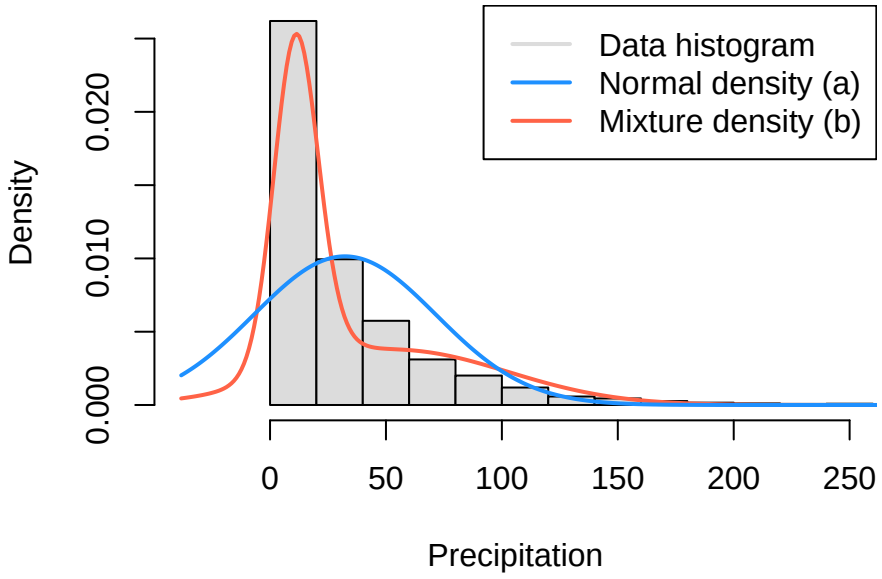

Figure 5: Mixture of normals