**Date:** 28 August, 2015

**Experiment No. 2**

**Aim:** To obtain the maximum likelihood estimate of the mean of the normal distribution when the variance is given.

**Experiment:** Let a random variable follow normal distribution with parameter μ and σ2. It is know that μ is either 4 or 5 and σ2 is 9. Find the maximum likelihood estimate of μ given the face that:

f (x; µ, σ2) = -∞<x<∞; -∞<µ<∞; σ2 > 0

**Theory:**

Consider a random variable X ~ N(µ, σ2), then its pdf is given by

f (x; µ, σ2) = -∞<x<∞; -∞<µ<∞; σ2 > 0

let u1, u2 Ԑ U(0, 1)

then x1 = and x2 = 2

where x1, x2 ~ N(0,1)

y1 = µ + σx1 and y2 = µ + σx2 ~ N(µ, σ2)

Now a statistics x̅ is a consistent estimator of population mean if

E(X) = µ and var(X) -> 0 as n -> ∞ where µ is the parameter of the distribution.

Log likelihood equation for N(µ, σ2) when σ2 is known is given by:

Ln(L) = --

**Algorithm:**

1. Open the file “norm2.txt” to read the data and “normout2.txt” to write the results using pointers.
2. Use randomize function to generate random numbers.
3. Numbers generated will lie between 0 and 1, we will convert them into normal sample using transformation given in theory, with μ = 4.5 and σ2 = 9.
4. Obtain the value of likelihood equation for μ = 4 and μ = 5 and analyse which μ gives greater value for the log likelihood equation.
5. Repeat steps 3 and 4 five times to obtain different values of log-likelihood equation.
6. Now choose between μ = 4 and μ = 5as MLE of μ, we select the μ for which log-likelihood equation gives highest value, each time we run the programme.
7. Results are expected in the file “normout2.txt”.

**Results:**

For 5 different samples of size 100, log-likelihood equation yields maximum value for when μ = 5, most of the times we run the programme. Hence we conclude that maximum likelihood estimate for the sample mean obtained from N(4.5, 9) is 4.

**Conclusion:**

Hence we obtain maximum likelihood estimate of the mean of Normal distribution when the variance is given.