HW ASSIGNMENT 3

DSCI - 552

1) In this problem we will perform Maximum Likelihood Estimation to find the parameters of a Gaussian Distribution. Consider the data distribution of **n** one dimensional points. Let them be denoted by the variable **X**. Then, if we assume they come from a Gaussian Distribution with mean μ and Variance **V**, **X** comes from the probability distribution:

$$P(x \mid \mu , V) = \frac{1}{\sqrt{2\pi V}} e^{-\frac{(x-\mu)^2}{2V}}$$

Apply MLE on the above equation by using the following hints.

a) The probability values of the Gaussian Distribution over X is given by

$$P(X \mid \mu , V) = \prod_{i=1}^{n} \frac{1}{\sqrt{2\pi V}} e^{-\frac{(xi-\mu)^2}{2V}}$$

We need to maximize this to find the values of μ and **V**. That is done by partially derivating this equation with respect to μ and **V** separately, setting it to 0 and solving for the values

b) Minimizing the log of a function is the same as maximizing the function itself. Take the log of the equation to minimize it.

b) Derivative of log(x) is 1/x

c) Derivative of f(g(x)) is f'(g(x)).g'(x)

d) log (ab) = log a + log b

e) log (e^x) = x

f) log (a^b) = b log a

2) Given the following statistics, what is the probability that a man has a particular disease in a town if he has been tested positive from a home testing kit

- One percent of men have the disease
- 90% of men who have the disease test positive on the home kit
- 8% of men who use the kit will have false positives.