

EXPERIMENT 4

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BATCH: EA-3;G2

AIM: To study about the concept of Maximum likelihood sequence estimation.

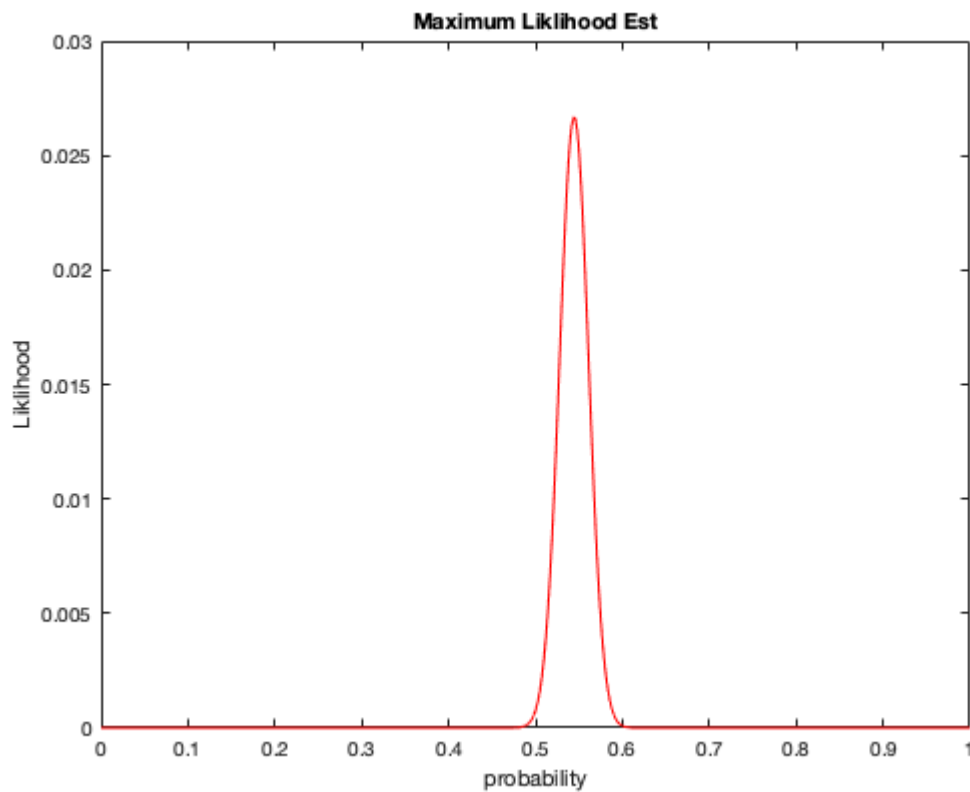
THEORY: Maximum likelihood sequence estimation (MLSE) is a mathematical algorithm to extract useful data out of a noisy data stream. Maximum Likelihood estimation (MLE) is an important tool in determining the actual probabilities of the assumed model of communication-based on the observed data. In reality, a communication channel can be quite complex and a model becomes necessary to simplify calculations at decoder side. The model should closely approximate the complex communication channel. There exist a myriad of standard statistical models that can be employed for this task; Gaussian, Binomial, Exponential, Geometric, Poisson, etc., A standard communication model is chosen based on empirical data.

A **binary symmetric channel** (or **BSCp**) is a common communications **channel** model used in coding theory and information theory. In this model, a transmitter wishes to send a bit (a zero or a one), and the receiver will receive a bit.

The parameters discussed in MLSE include Maximum Likelihood Decoding, Maximum Likelihood Estimation, Prediction and Estimation. Since it is a ratio so it has no units.

CODE AND OUTPUT:

```
d=410;
n=90*10;
k=n-d;
q=0:0.002:1;
y=binopdf(k,n,q);
plot(q,y,"Color","r")
xlabel("probability")
ylabel("Likelihood")
title("Maximum Likelihood Est")
```



```
[maxY,maxIndex]=max(y)
```

```
maxY = 0.0267  
maxIndex = 273
```

```
disp(sprintf("MLE of q is %f",q(maxIndex)))
```

```
MLE of q is 0.544000
```

Therefore, the MLSE is 0.544000. The probability of success for this BSC is $q = 0.544$ whereas the probability of error is $p = 1 - q = 0.456$.

CONCLUSION: From this experiment we have learnt the concept of Maximum Likelihood Sequence Estimation in Wireless Communications. We have also learnt the other parameters surrounding MLSE such as Decoding, Prediction, Estimation and Binary Symmetric Channel.