Assignment 6

Bayes Computation

**Question 1:**

P(breast\_cancer)=0.01

P(not breast\_cancer)=0.99

As per the slide values of true positive given as 80% and that of false positive is 9.6%

P(positive\_result | breast\_cancer)=0.8

P(negative\_result | breast\_cancer) =0.2

P(positive\_result | not breast\_cancer) = 0.096

P(negative\_result | not breast\_cancer) = 0.904

**Calculation:**

Equation1:

P(breast\_cancer | positive\_result) = p(positive\_result | breast\_cancer ) x p( breast\_cancer ) / p( positive result )

Equation2:

P( positive\_result) = P(positive\_result, breast\_cancer)+P(positive\_result, not breast\_cancer)

= P(breast\_cancer) \* P(positive\_result | breast\_cancer) +

P(not breast\_cancer) \* P(positive\_result | not breast\_cancer)

= (0.01)\*(0.8)+(0.99)\*(0.096)

= 0.10304

**Substituting result of equation 2 into equation 1**

P(breast\_cancer | positive\_result) = p(positive\_result | breast\_cancer ) x p( breast\_cancer ) / p( positive result )

P(breast\_cancer | positive\_result) = (0.8)\*(0.01)/(0.10304) = 0.07763 ~ 8%

Given the positive result of a mammogram test, there are only **8%** chances of having a cancer.

Compute probability of a Disease given symptoms 1 and 2 i.e P(D | S1, S2)

P(D) 🡪 probability of a disease

P(S1) 🡪 probability of symptom 1

P(S2) 🡪 probability of symptom 2

Random probabilities for Disease and Symptoms

P(D) = 0.01

P(not D) = 0.99

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P(S1 | D) = 0.9

P(not S1 | D) = 0.1

P(S1 | not D)= 0.01

P(not S1 | not D) = 0.99

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P(S2 | D ) = 0.8

P(not S2 | D) = 0.2

P( S2 | not D) = 0.01

P(not S2 | not D ) = 0.99

**Calculation:**

P(D|S1&S2) = [P(S2|D)\*P(S1|D)\*P(D)] / [P(S2|D)\*P(S1|D)\*P(D)] + [P(not D)\*P(S1|not D)\*P(S2|not D)]

= [(0.8)\*(0.9)\*(0.01)] / [(0.8)\*(0.9)\*(0.01)] + [(0.99)\*(0.01)\*(0.01)]

= 0.0072 / ( 0.0072+0.000099)

= 0.0072 / 0.007299

= 0.986436 ~ 99%

Conclusion:

Probability of having a disease given symptom 1 and 2 has a positive result comes out to be **99%.**

Result Using GeNIe:

