**STATISTICS ASSIGNMENT\_7**

**1.A spam filter is designed by looking at commonly occurring phrases in spam. Suppose that 80% of email is spam. In 10% of the spam emails, the phrase “free money” is used, whereas this phrase is only used in 1% of non-spam emails. A new email has just arrived, which does mention “free money”. What is the probability that it is spam?**

Let S be the event that the email is spam, and F be the event that the email mentions "free money".

By Bayes' theorem, P(S | F) = P(F | S) \* P(S) / (P(F | S) \* P(S) + P(F | S') \* P(S')).

Where P(S) = 0.8 is the prior probability that the email is spam, P(F | S) = 0.1 is the probability that "free money" is used given that the email is spam, and P(F | S') = 0.01 is the probability that "free money" is used given that the email is not spam.

So, P(S | F) = 0.1 \* 0.8 / (0.1 \* 0.8 + 0.01 \* 0.2) = 0.89.

The probability that the email is spam given that it mentions "free money" is 0.89.