**Baye’s Theorem-**

Bayes' theorem is a fundamental result in probability theory that provides a way to update probabilities based on new evidence or information. It establishes a relationship between conditional probabilities and allows us to calculate the probability of an event given some observed data.

The theorem is named after Thomas Bayes, an 18th-century English mathematician, and it has applications in various fields, including statistics, machine learning, and data analysis.

Bayes' theorem is stated as follows:

P(A|B) = (P(B|A) \* P(A)) / P(B)

where:

* P(A|B) is the conditional probability of event A occurring given that event B has occurred.
* P(B|A) is the conditional probability of event B occurring given that event A has occurred.
* P(A) and P(B) are the marginal probabilities of events A and B, respectively.

In words, Bayes' theorem states that the probability of event A occurring given that event B has occurred is proportional to the likelihood of event B occurring given that event A has occurred, multiplied by the prior probability of event A. The resulting value is then normalized by the probability of event B.

The theorem provides a framework for updating our beliefs or probabilities as we receive new information. It allows us to revise our initial estimates or prior probabilities based on observed data, providing a posterior probability that incorporates both the prior knowledge and the new evidence.

Bayes' theorem is particularly useful in scenarios involving diagnostic testing, classification problems, and inference in Bayesian statistics. It allows us to make more informed decisions by incorporating new information and updating probabilities in a principled manner.