1. **What is prior probability? Give an example.**

**-** Prior probability, in the context of Bayesian probability and statistics, refers to the initial or prior belief or probability assigned to an event or hypothesis before considering new evidence or data.

Example: In medical diagnosis, before conducting any tests, the prior probability that a patient has a certain disease might be based on the overall prevalence of the disease in the population. This prior probability serves as the starting point for making a diagnosis and is updated with test results to calculate a posterior probability.

1. **What is posterior probability? Give an example.**

**-** Posterior probability, in the context of Bayesian probability and statistics, refers to the updated probability of an event or hypothesis after incorporating new evidence or data, taking into account the prior probability and the likelihood of the evidence.

Example: In medical diagnosis, the posterior probability that a patient has a certain disease is calculated by combining the prior probability (based on disease prevalence) with the results of diagnostic tests (likelihood of the observed symptoms given the disease). The posterior probability provides a more informed estimate of the patient's likelihood of having the disease after considering the test results.

1. **What is likelihood probability? Give an example.**

* Likelihood probability, in the context of Bayesian statistics, represents the probability of observing specific evidence or data given a particular hypothesis or model. It quantifies how well the evidence supports the hypothesis.

Example: In a coin-toss experiment, the likelihood probability of getting "heads" (H) given that the coin is fair might be expressed as P(H|Fair) = 0.5. This means there is a 50% chance of observing "heads" if the coin is fair. Likelihood is an important component in Bayes' theorem, used to update prior probabilities to posterior probabilities.

1. **What is Naïve Bayes classifier? Why is it named so?**

* The Naïve Bayes classifier is a simple and effective probabilistic machine learning algorithm used for classification tasks. It's called "naïve" because it makes a simplifying assumption that the features used for classification are conditionally independent, even though this may not be true in practice. Despite this simplification, Naïve Bayes often performs well and is named after the Bayesian probability theorem. It's based on Bayes' theorem and uses probabilistic principles to make predictions by calculating the probability of a given class label for a given set of features.

1. **What is optimal Bayes classifier?**

* The optimal Bayes classifier, also known as the Bayes optimal classifier, is a theoretical classification algorithm that achieves the highest possible accuracy when classifying data. It's based on Bayes' theorem and uses the true underlying probability distributions of the data. In practice, it's often unattainable because it requires complete knowledge of these distributions, which is rarely available. Instead, it serves as a benchmark for comparing the performance of other classification algorithms.