1. What is prior probability? Give an example.

2. What is posterior probability? Give an example.

3. What is likelihood probability? Give an example.

4. What is Naïve Bayes classifier? Why is it named so?

5. What is optimal Bayes classifier?

6. Write any two features of Bayesian learning methods.

7. Define the concept of consistent learners.

8. Write any two strengths of Bayes classifier.

9. Write any two weaknesses of Bayes classifier.

10. Explain how Naïve Bayes classifier is used for

1. Text classification

2. Spam filtering

3. Market sentiment analysis

Answers:

1. Prior probability refers to the probability of an event occurring before taking into account any new information or evidence. An example of prior probability is the likelihood of rolling a six on a fair dice, which is 1/6 or approximately 0.1667.
2. Posterior probability refers to the probability of an event occurring after taking into account new information or evidence. An example of posterior probability is the probability of a patient having a disease given that they test positive for it.
3. Likelihood probability refers to the probability of obtaining a specific set of data given a certain hypothesis or model. An example of likelihood probability is the probability of observing a specific set of DNA sequences given a certain evolutionary model.
4. Naïve Bayes classifier is a probabilistic algorithm used for classification tasks. It assumes that the features of a data point are independent of each other, and it calculates the probability of each class based on the features. The classifier is named "naïve" because of its assumption of feature independence.
5. Optimal Bayes classifier is a classification algorithm that uses Bayes' theorem to calculate the probability of a data point belonging to a certain class, and it selects the class with the highest probability as the output. It is called "optimal" because it makes the most accurate predictions based on the available information.
6. Two features of Bayesian learning methods are: (1) they can handle uncertainty and make probabilistic predictions, and (2) they can update their predictions as new data becomes available.
7. Consistent learners are algorithms that converge to the true solution as the amount of data approaches infinity. In other words, as the amount of data increases, the algorithm's predictions become increasingly accurate.
8. Two strengths of Bayes classifier are: (1) it is a simple and fast algorithm that can handle high-dimensional data, and (2) it can provide probabilistic predictions that can be interpreted and used for decision making.
9. Two weaknesses of Bayes classifier are: (1) it assumes independence between features, which may not hold in many real-world scenarios, and (2) it may suffer from the "curse of dimensionality" when the number of features is too high.

* Text classification: Naïve Bayes classifier can be used to classify text documents into different categories, such as spam vs. non-spam emails or positive vs. negative reviews. It treats each word in the document as a feature and calculates the probability of each category based on the occurrence of the words.
* Spam filtering: Naïve Bayes classifier is commonly used for spam filtering in email systems. It analyzes the content of the email and calculates the probability of it being spam or non-spam based on certain features such as the presence of certain keywords or the sender's email address.
* Market sentiment analysis: Naïve Bayes classifier can be used to analyze the sentiment of social media posts or news articles about a certain product or company. It treats certain words or phrases as features and calculates the probability of positive or negative sentiment based on their occurrence in the text.