**Assignment 12 Solutions**

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

**Ans:** Prior probability shows the likelihood of an outcome in a given dataset. For example, in the mortgage case, P(Y) is the default rate on a home mortgage, which is 2%. P(Y|X) is called the conditional probability, which provides the probability of an outcome given the evidence, that is, when the value of X is known.

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

**Ans:**: Posterior probability is a revised probability that takes into account new available information. For example, let there be two urns, urn A having 5 black balls and 10 red balls and urn B having 10 black balls and 5 red balls.

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

**Ans:** Likelihood Function in Machine Learning and Data Science is the joint probability distribution(jpd) of the dataset given as a function of the parameter. Think of it as the probability of obtaining the observed data given the parameter values.

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

**Ans:** Naive Bayes is a simple and powerful algorithm for predictive modeling. Naive Bayes is called naive because it assumes that each input variable is independent. This is a strong assumption and unrealistic for real data; however, the technique is very effective on a large range of complex problems.

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

**Ans:** The Bayes Optimal Classifier is a probabilistic model that makes the most probable prediction for a new example. Bayes Optimal Classifier is a probabilistic model that finds the most probable prediction using the training data and space of hypotheses to make a prediction for a new data instance.

**6. Write any two features of Bayesian learning methods ?**

**Ans:** A probability distribution over observed data for each possible hypothesis. New instances can be classified by combining the predictions of multiple hypotheses, weighted by their probabilities.

**7. Define the concept of consistent learners ?**

**Ans:** **Consistent Learners:** A learner L using a hypothesis H and training data D is said to be a consistent learner if it always outputs a hypothesis with zero error on D whenever H contains such a hypothesis. • By definition, a consistent learner must produce a hypothesis in the version space for H given D.

**8. Write any two strengths of Bayes classifier ?**

**Ans:** This algorithm works quickly and can save a lot of time. Naive Bayes is suitable for solving multi-class prediction problems. If its assumption of the independence of features holds true, it can perform better than other models and requires much less training data.

**9. Write any two weaknesses of Bayes classifier ?**

**Ans:** The greatest weakness of the naïve Bayes classifier is that it relies on an often-faulty assumption of equally important and independent features which results in biased posterior probabilities.

**10. Explain how Naïve Bayes classifier is used for:**

1. Text classification
2. Spam filtering
3. Market sentiment analysis

**Ans:** Navie Bayes Classifier is used for:

* **Text classification:** The Naive Bayes classifier is a simple classifier that classifies based on probabilities of events. It is the applied commonly to text classification. With the training set, we can train a Naive Bayes classifier which we can use to automaticall categorize a new sentence.
* **Spam filtering:**  
  Naive Bayes classifiers work by correlating the use of tokens (typically words, or sometimes other things), with spam and non-spam e-mails and then using Bayes' theorem to calculate a probability that an email is or is not spam. It is one of the oldest ways of doing spam filtering, with roots in the 1990s.
* **Market sentiment analysis:**  
  Market Sentiment analysis is a field dedicated to extracting subjective emotions and feelings from text. One common use of sentiment analysis is to figure out if a text expresses negative or positive feelings. Naive Bayes is a popular algorithm for classifying text.