

3. Explain Naive Bayes classifier and training process.

Problem statement: To predict whether a person will purchase a product on a specific combination of day, discount, and free delivery using a Naive Bayes classifier. Under the day, look for variables, like weekday, weekend, and holiday. For any given day, check if there are a discount and free delivery. Based on this information, we can predict if a customer would buy the product or not. Based on the dataset containing the three input types—day, discount, and free delivery— the frequency table for each attribute is populated.

For Bayes theorem, let the event 'buy' be A and the independent variables (discount, free delivery, day) be B.

Let us calculate the likelihood for one of the “day” variables, which includes weekday, weekend, and holiday variables.

We get a total of:

11 weekdays

Eight weekends

11 holidays

The total number of days adds up to 30 days.

There are nine out of 24 purchases on weekdays

There are seven out of 24 purchases on weekends

There are eight out of 24 purchases on holidays

Based on the above likelihood table, let us calculate some conditional probabilities:

$$P(B) = P(\text{Weekday})$$

$$= 11/30$$

$$= 0.37$$

$$P(A) = P(\text{No Buy})$$

$$= 6/30$$

$$= 0.2$$

$$P(B | A)$$

$$= P(\text{Weekday} | \text{No Buy})$$

$$= 2/6$$

$$= 0.33$$

$$P(A | B)$$

$$= P(\text{No Buy} | \text{Weekday})$$

$$= P(\text{Weekday} | \text{No Buy}) * P(\text{No Buy}) / P(\text{Weekday})$$

$$= (0.33 * 0.2) / 0.37$$

$$= 0.18$$

The probability of purchasing on the weekday = 11/30 or 0.37

It means out of the 30 people who came into the store throughout the weekend, weekday, and holiday, 11 of those purchases were made on weekdays.

The probability of not making a purchase = 6/30 or 0.2. There's a 20 percent chance that they're not going to make a purchase, no matter what day of the week it is.

Finally, we look at the probability of B (i.e., weekdays) when no purchase occurs.

The probability of the weekday without a purchase = 0.18 or 18 percent. As the probability of (No | Weekday) is less than 0.5, the customer will most likely buy the product on a weekday. Next, let's see how the table and conditional probabilities work in the Naive Bayes Classifier.