How can we use R to calculate conditional probability?

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R is a statistical programming language that can be used to calculate conditional probability. Conditional probability is the measure of the likelihood of an event occurring given that another event has already occurred. In order to calculate conditional probability in R, one must first define the relevant events and their probabilities. Then, using mathematical operators and functions, R can be used to calculate the conditional probabilities and display the results in a clear and organized manner. This allows for efficient and accurate analysis of data and can aid in decision making and problem solving in various fields such as finance, healthcare, and marketing. R's flexibility and powerful statistical capabilities make it a valuable tool for calculating conditional probability and providing valuable insights into complex data.

Calculate Conditional Probability in R

The conditional probability that event *A* occurs, given that event *B* has occurred, is calculated as follows:

$P(A|B) = P(A \cap B) / P(B)$

where:

$P(A \cap B)$ = the probability that event *A* and event *B* both occur.

P(B) = the probability that event B occurs.

The following examples show how to use this formula to calculate conditional probabilities in R.

Example 1: Calculate Conditional Probability Using Values

Suppose we send out a survey to 300 individuals asking

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them which sport they like best: baseball, basketball, football, or soccer.

Suppose we know that the probability that an individual is male *and* prefers baseball as their favorite sport is 0.113.

Suppose we also know that the probability that any individual prefers baseball as their favorite sport is 0.226.

Given that an individual prefers baseball, we could calculate the probability that they're male to be:

P(Male|Prefers Baseball) = P(Male∩Prefers Baseball) / P(Prefers Baseball)P(Male|Prefers Baseball) = 0.113 / 0.226P(Male|Prefers Baseball) = 0.5

Given that an individual prefers baseball, the probability that they're male is 0.5.

Here's how we can calculate this probability in R:

```
#define probability of being male and preferring baseball
p_male_baseball <- 0.113
```

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```
#define probability of preferring baseball
p_baseball <- 0.226

#calculate probability of being male, given that individual prefers baseball
p_male_baseball / p_baseball
```

```
0.5
```

Example 2: Calculate Conditional Probability Using a Table

Suppose we send out a survey to 300 individuals asking them which sport they like best: baseball, basketball, football, or soccer.

```
#create data frame to hold survey responses
df <- data.frame(gender=rep(c('Male', 'Female'), each=150),
sport=rep(c('Baseball', 'Basketball', 'Football', 'Soccer', 'Baseball', 'Basketball', 'Football', 'Soccer'),
times=c(34, 40, 58, 18, 34, 52, 20, 44)))

#create two-way table from data frame
survey_data <- addmargins(table(df$gender, df$sport))

#view table
```

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survey_data

Baseball Basketball Football Soccer Sum
Female 34 52 20 44 150
Male 34 40 58 18 150
Sum 68 92 78 62 300

We can use the following syntax to extract values from the table:

#extract value in second row and first column
survey_data

34

We can use the following syntax to calculate the probability that an individual is male, given that they prefer baseball as their favorite sport:

#calculate probability of being male, given that individual prefers baseball
survey_data / survey_data

0.5

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And we can use the following syntax to calculate the probability that an individual prefers basketball as their favorite sport, given that they're female:

```
#calculate probability of preferring basketball, given that individual is female
survey_data / survey_data
```

0.3466667

We can use this basic approach to calculate any conditional probability we'd like from the table.

The following tutorials provide additional information on dealing with probability:

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