What is the interpretation of Cramer’s V and can you provide examples?

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Cramer's V is a statistical measure that is used to determine the strength and direction of association between two categorical variables. It ranges from 0 to 1, with 0 indicating no association and 1 indicating a perfect association. This measure is often used in the field of social sciences and can provide insights into the relationship between different variables. For example, Cramer's V can be used to determine the association between gender and political party affiliation, or between education level and income level. It is a useful tool for analyzing and interpreting data in various research studies and can help researchers understand the underlying patterns and relationships within their data.

Interpret Cramer's V (With Examples)

Cramer's V is a measure of the strength of association between two .

It ranges from 0 to 1 where:

0 indicates no association between the two variables.1 indicates a perfect association between the two variables.

It is calculated as:

Cramer's V = √(X2/n) / min(c-1, r-1)

where:

X2: The Chi-square statisticn: Total sample sizer: Number of rowsc: Number of columns

How to Interpret Cramer's V

The following table shows how to interpret Cramer's V based on the degrees of freedom:

Degrees of freedom	Small	Medium	Large
1	0.10	0.30	0.50
2	0.07	0.21	0.35
3	0.06	0.17	0.29
4	0.05	0.15	0.25
5	0.04	0.13	0.22

The following examples show how to interpret Cramer's V in different situations.

Example 1: Interpreting Cramer's V for 2×3 Table

Suppose we want to know if there is an association between eye color and gender so we survey 50 individuals and obtain the following results:

		Eye Color		
		Blue	**Green**	**Brown**
Gender	**Male**	6	8	12
	Female	9	5	10

We can use the following code in R to calculate Cramer's V for these two variables:

```
library(rcompanion)

#create table
data = matrix(c(6, 9, 8, 5, 12, 10), nrow=2)

#view table
data

6 8 12
9 5 10

#calculate Cramer's V
cramerV(data)

Cramer V
0.1671
```

Cramer's V turns out to be 0.1671.

df = min(#rows-1, #columns-1)df = min(1, 2)df = 1

Referring to the table above, we can see that a Cramer's V of 0.1671 and degrees of freedom = 1 indicates a small (or "weak") association between eye color and gender.

Example 2: Interpreting Cramer's V for 3×3 Table

Suppose we want to know if there is an association between eye color and political party preference so we survey 50 individuals and obtain the following results:

		Eye Color		
		Blue	Green	Brown
Political Party Preference	Republican	8	5	6
	Democrat	2	8	3
	Independent	4	6	8

We can use the following code in R to calculate Cramer's V for these two variables:

```
library(rcompanion)

#create table
data = matrix(c(8, 2, 4, 5, 8, 6, 6, 3, 8), nrow=3)

#view table
data
```

```
8 5 6
2 8 3
4 6 8
```

#calculate Cramer's V
cramerV(data)

Cramer V
0.246

Cramer's V turns out to be 0.246.

The degrees of freedom would be calculated as:

df = min(#rows-1, #columns-1)df = min(2, 2)df = 2

Referring to the table above, we can see that a Cramer's V of 0.246 and degrees of freedom = 2 indicates a medium (or "moderate") association between eye color and political party preference.

The following tutorials explain how to calculate Cramer's V in different statistical software: