

# Test a Perceptual Phenomenon

December 17, 2017

## 0.0.1 Analyzing the Stroop Effect

Perform the analysis in the space below. Remember to follow [the instructions](#) and review the [project rubric](#) before submitting. Once you've completed the analysis and write up, download this file as a PDF or HTML file and submit in the next section.

- (1) What is the independent variable? What is the dependent variable?

The independent variable is the consistency of the word and the hint. The dependent variable is the time the player uses to finish the task.

- (2) What is an appropriate set of hypotheses for this task? What kind of statistical test do you expect to perform? Justify your choices.

Hypotheses: H0: The population mean of the time of the congruent situation == The population mean of the time of the incongruent situation H1: The population mean of the time of the congruent situation != The population mean of the time of the incongruent situation

Statistical test: paired t-test,  $\alpha = 0.05$ , two-tailed

Reason to use this type of test: 1: population mean and population standard deviation are unknown 2: samples are obtained under two conditions and number of samples is less than 30

- (3) Report some descriptive statistics regarding this dataset. Include at least one measure of central tendency and at least one measure of variability. The name of the data file is 'stroop-data.csv'.

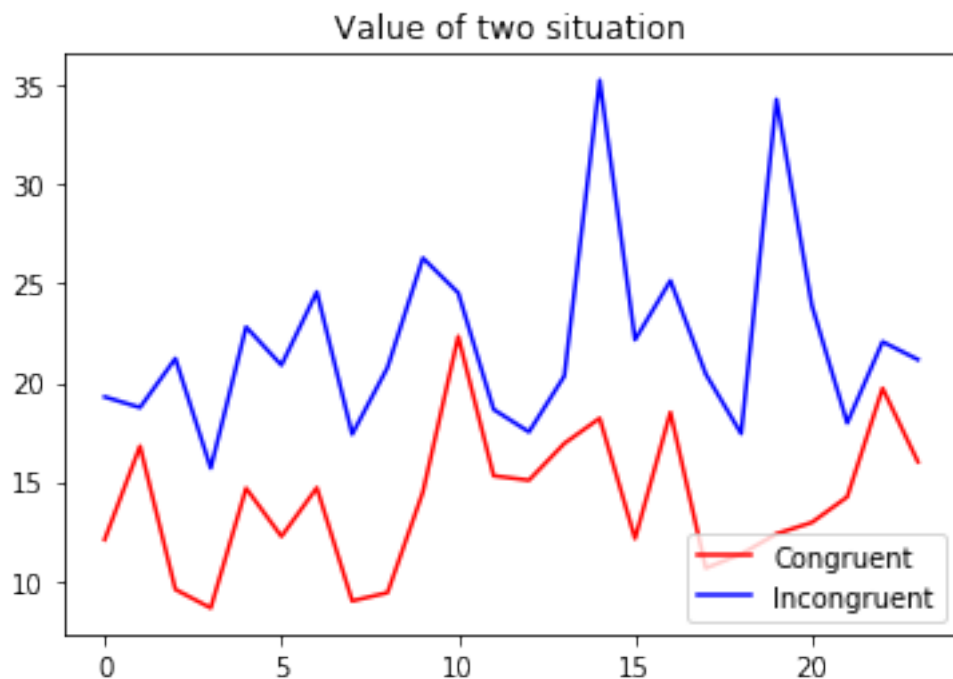
```
In [11]: import pandas as pd
import numpy as np
data = pd.read_csv('stroopdata.csv', sep = ',', header = 0)
mean_congruent = np.mean(data['Congruent'])
print("congruent mean = ",mean_congruent)
mean_incongruent = np.mean(data['Incongruent'])
print("incongruent mean = ",mean_incongruent)
var_congruent = np.std(data['Congruent'],ddof = 1)
print("congruent var = ",var_congruent)
var_incongruent = np.std(data['Incongruent'],ddof = 1)
print("incongruent var = ",var_incongruent)
```

```
congruent mean = 14.051125
incongruent mean = 22.0159166667
congruent var = 3.55935795765
incongruent var = 4.79705712247
```

Mean of the congruent situation is 14.0511 Mean of the incongruent situation is 22.0159 Standard deviation of the congruent situation is 3.5594 Standard deviation of the incongruent situation is 4.7971

- (4) Provide one or two visualizations that show the distribution of the sample data. Write one or two sentences noting what you observe about the plot or plots.

```
In [14]: # Build the visualizations here
import matplotlib.pyplot as plt
plt.title('Value of two situation')
plt.plot(range(0,len(data['Congruent'])), data['Congruent'][0:], 'r', label = 'Congruent')
plt.plot(range(0,len(data['Incongruent'])), data['Incongruent'][0:], 'b', label = 'Incongruent')
plt.legend(loc='lower right')
plt.show()
```



The values of incongruent situation are all higher than the values of congruent situation

- (5) Now, perform the statistical test and report the results. What is the confidence level and your critical statistic value? Do you reject the null hypothesis or fail to reject it? Come to a conclusion in terms of the experiment task. Did the results match up with your expectations?

```
In [15]: # Perform the statistical test here
```

```
import scipy.stats as st
```

```
st.ttest_rel(data['Congruent'],data['Incongruent'])
```

```
Out[15]: Ttest_relResult(statistic=-8.020706944109957, pvalue=4.1030005857111781e-08)
```

alpha = 0.05  
t\_critical = 2.069 (according to the table)  
Because pvalue << alpha, we reject null hypothesis. This means the incongruent situation significantly influences the time of people finish the task.