Test a Perceptual Phenomenon

February 16, 2019

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, upload that PDF/HTML into the workspace here (click on the orange Jupyter icon in the upper left then Upload), then use the Submit Project button at the bottom of this page. This will create a zip file containing both this .ipynb doc and the PDF/HTML doc that will be submitted for your project.

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

The independent Variables are congruent words condition and incongruent words condition. The dependent Variable is the time required to name the ink colors

(2) What is an appropriate set of hypotheses for this task? Specify your null and alternative hypotheses, and clearly define any notation used. Justify your choices.

Null Hypotheses: time required for the conguruent words equals the time required for the incongruent words Alternatuve Hypotheses: the time required for the incongurent words is higher the the time required for the congurent words
H0: i c
H1: i > c
i -> the incongruent mean c -> the congruent mean
the Statistical test is: Linear regression as the values are linear and non-categoric

(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 [3]:
```
# Perform the analysis here

import math
import pandas as pd
import numpy as np
from scipy.stats import t
%matplotlib inline
```

```
In [6]: df=pd.read_csv('stroopdata.csv')

        df.describe()
        print(df.mean(axis=0))
        print(df.std(axis=0))
```

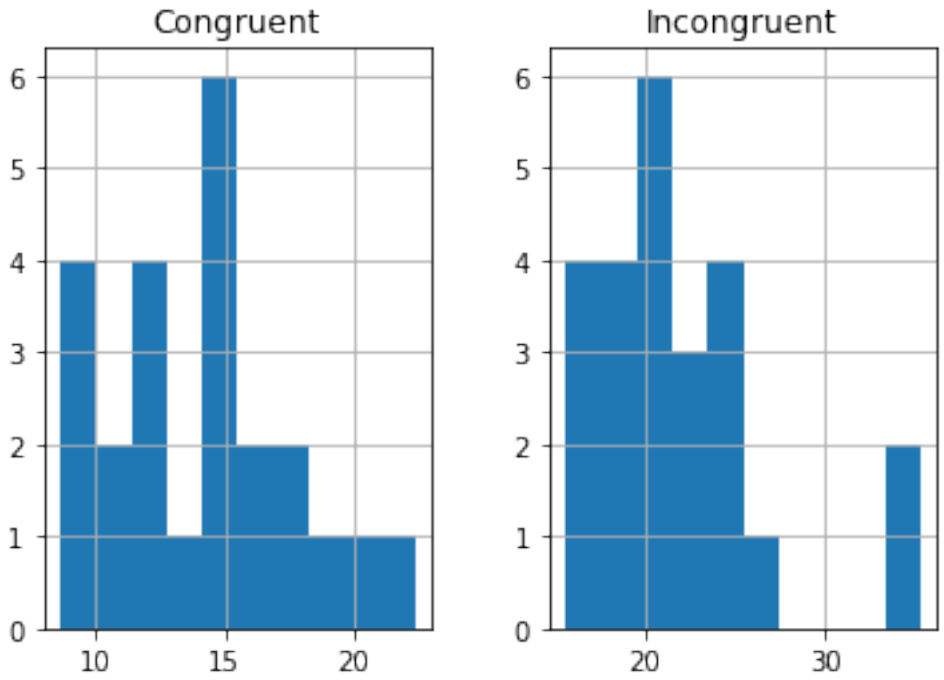
```
Congruent      14.051125
Incongruent    22.015917
dtype: float64
Congruent      3.559358
Incongruent    4.797057
dtype: float64
```

The mean of the conguernt readings is 14.05 sec with standard deviaton of 3.55 sec The mean of the inconguernt readings is 22.015 sec with standard deviation of 4.8 sec

(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.

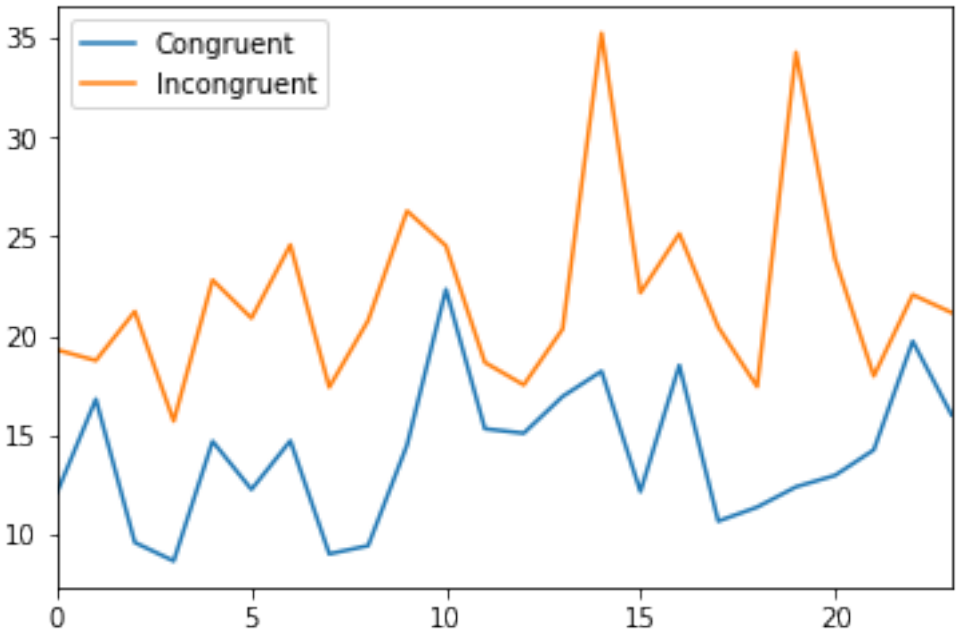
```
In [7]: df.hist()
```

```
Out[7]: array([[<matplotlib.axes._subplots.AxesSubplot object at 0x7fcb70651128>,
                <matplotlib.axes._subplots.AxesSubplot object at 0x7fcb6e5ba0f0>]], dtype=object
```




```
In [8]: df.plot()
```

```
Out[8]: <matplotlib.axes._subplots.AxesSubplot at 0x7fcb706754a8>
```



the data is a bit more normally distributed in the case of congruent conditions in compraison to the incongruent case

(5) Now, perform the statistical test and report your results. What is your confidence level or Type I error associated with your test? What is your conclusion regarding the hypotheses you set up? Did the results match up with your expectations? **Hint:** Think about what is being measured on each individual, and what statistic best captures how an individual reacts in each environment.

```
In [9]: # Perform the statistical test here

        #number of subjects in the sample
        n = len(df)
        n
```

```
Out[9]: 24
```

```
In [11]: #t-critical value for a 95% confidence level and DF=23
         t.ppf(0.95, 23)
```

```
Out[11]: 1.7138715277470473
```

```
In [ ]: For a confidence level of 95% and 23 degrees of freedom,  t-critical value=1.7139

        the estimated difference of the means is 22.02 - 14.05 = 7.97
```

```
In [14]: df['Difference'] = df['Congruent'] - df['Incongruent']
         df['Difference'].std()

Out[14]: 4.8648269103590556

In [ ]: Standard Deviation = 4.864

In [15]: #T Test
         7.97/(4.8648 / math.sqrt(24))

Out[15]: 8.025996238275749
```

(6) Optional: What do you think is responsible for the effects observed? Can you think of an alternative or similar task that would result in a similar effect? Some research about the problem will be helpful for thinking about these two questions!

t-statistic 8.02 is greater than the critical value 1.7139,So we can reject the null hypothesis. which means that it takes longer time to fulfill the incongruent condition