Test a Perceptual Phenomenon

April 2, 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?

Independent variable is the congruent or incongruent condition. The dependent variable is time taken.

(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.

H0: Ti = Tc H1: Ti > Tc
Ti is the average time taken for incongruent condition Tc is the average time taken for congruent condition.
The test to be carried out is t test. The reason for this choice is that t test is an apropriate test in determining if there is a significant difference between the means of two groups.In this case, we're testing the difference between the mean time taken for incongruent and congruent condition. Therefore, t test is a good test.

(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 [23]: # Perform the analysis here
         import pandas as pd
         import matplotlib.pyplot as plt
         import numpy as np
         df=pd.read_csv("stroopdata.csv")

In [4]: df.describe()
```

1

Out[4]:

```
          Congruent   Incongruent
count    24.000000     24.000000
mean     14.051125     22.015917
std       3.559358      4.797057
min       8.630000     15.687000
25%      11.895250     18.716750
50%      14.356500     21.017500
75%      16.200750     24.051500
max      22.328000     35.255000
```

There are 24 records in the dataset. Congruent has a mean of 14.05. The minimum value is 8.63 and the maximum value is 22.33. The standard deviation is 3.56. Incongruent has a mean of 22.06. The minimum value is 15.79 and maximum value is 35.26.

(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.
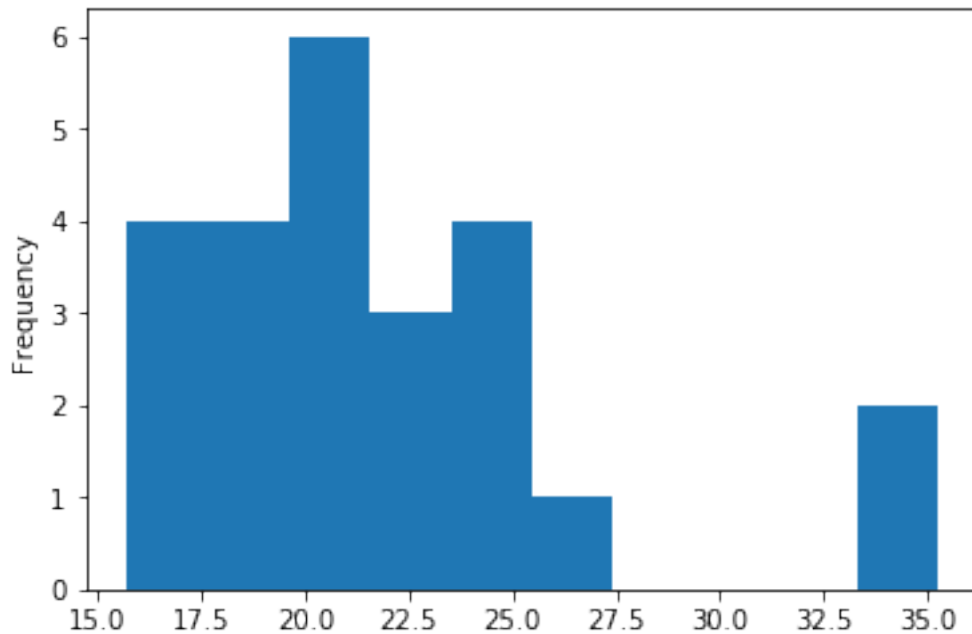
In [17]: # Distribution of Congruent
         df['Congruent'].plot.hist()

Out[17]: <matplotlib.axes._subplots.AxesSubplot at 0x7ff812af9048>
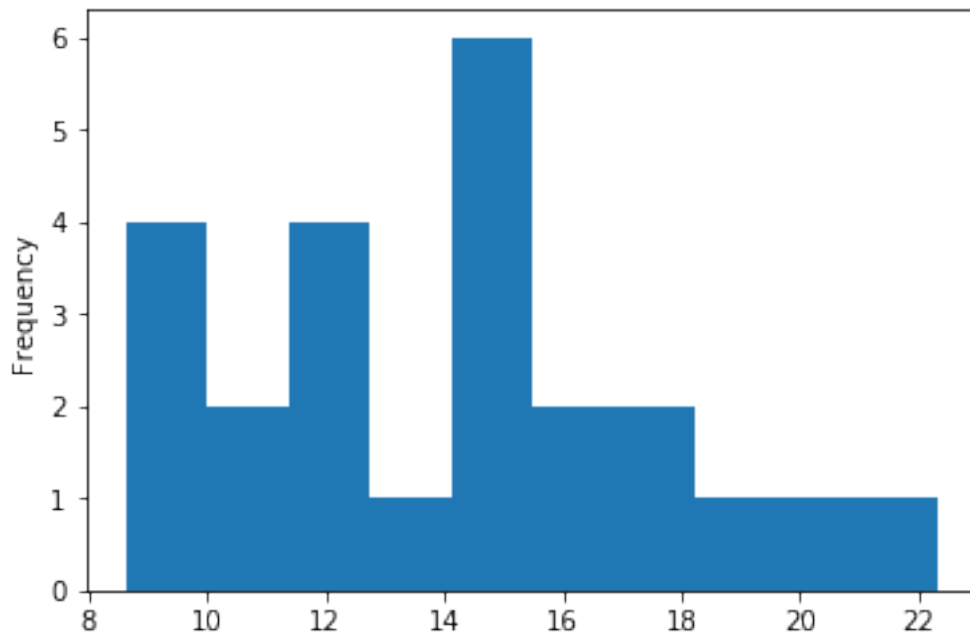
In [18]: # Distribution of Incongruent
         df['Incongruent'].plot.hist()

Out[18]: <matplotlib.axes._subplots.AxesSubplot at 0x7ff812c62e48>

The distribution of Congruent doesn't seem to follow normal distribution. The distribution of Incongruent has an outlier.

(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 [24]: # Perform the statistical test here
         df['Difference']=df['Incongruent']-df['Congruent']

In [25]: df.describe()

Out[25]:        Congruent  Incongruent  Difference
         count  24.000000    24.000000   24.000000
         mean   14.051125    22.015917    7.964792
         std     3.559358     4.797057    4.864827
         min     8.630000    15.687000    1.950000
         25%    11.895250    18.716750    3.645500
         50%    14.356500    21.017500    7.666500
         75%    16.200750    24.051500   10.258500
         max    22.328000    35.255000   21.919000

In [26]: Mean_difference=7.96
         Std_difference=4.86
         n=24
```

```
        #degree of freedom=23
        # At 23 degree of freedom and 0.05, the critical value =1.714
        # t_statistic = Mean_difference / (Std_difference / np.sqrt(n))
        t_statistic=7.96/(4.86/np.sqrt(24))

In [27]: t_statistic

Out[27]: 8.0238429434378986
```

1 Conclusion:

Since t_statistics> critical value, we can reject the null hypothesis and conclude the mean time taken for incongruent condition is greater than the mean time taken for congruent condition.

2 Reference

https://s3.amazonaws.com/udacity-hosted-downloads/t-table.jpg

The t_statistic (8.023) is much greater than the critical value (1.714). Therefore, we can reject the null hypothesis and conclude that Time taken for incongruent conditon > Time taken for congruent condition

(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!

--write answer here--