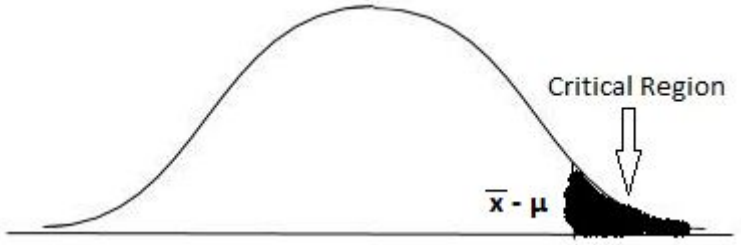
1. What is our independent variable? What is our dependent variable?
Dependent Variable: The time taken to name the ink colors.
Independent Variable: Incongruent condition in Stroop task

2. What is an appropriate set of hypotheses for this task? What kind of statistical test do you expect to perform? Justify your choices.
Null Hypothesis: Stroop task has no effect on the time taken to name the ink colours.
Alternative Hypothesis: Stroop task increases the time taken to name the ink colours in incongruent conditions.

$$H_0 : \mu_{incongruent} - \mu_{congruent} <= 0$$
$$H_{Alt} : \mu_{incongruent} - \mu_{congruent} > 0$$

where:
H_0 is null hypothesis,
H_{Alt} is alternative hypothesis,
$\mu_{incongruent}$ is the mean time taken in incongruent condition,
$\mu_{congruent}$ is the mean time taken in congruent condition.

Type of test: One-tailed t-test in positive direction
Reason: Since we do not have population parameters we will use t-statistics and not z-score.
We will have one tailed test since we expect a positive value, i.e. we expect $\mu_{incongruent} > \mu_{congruent}$. Hence our critical region would be in the right.

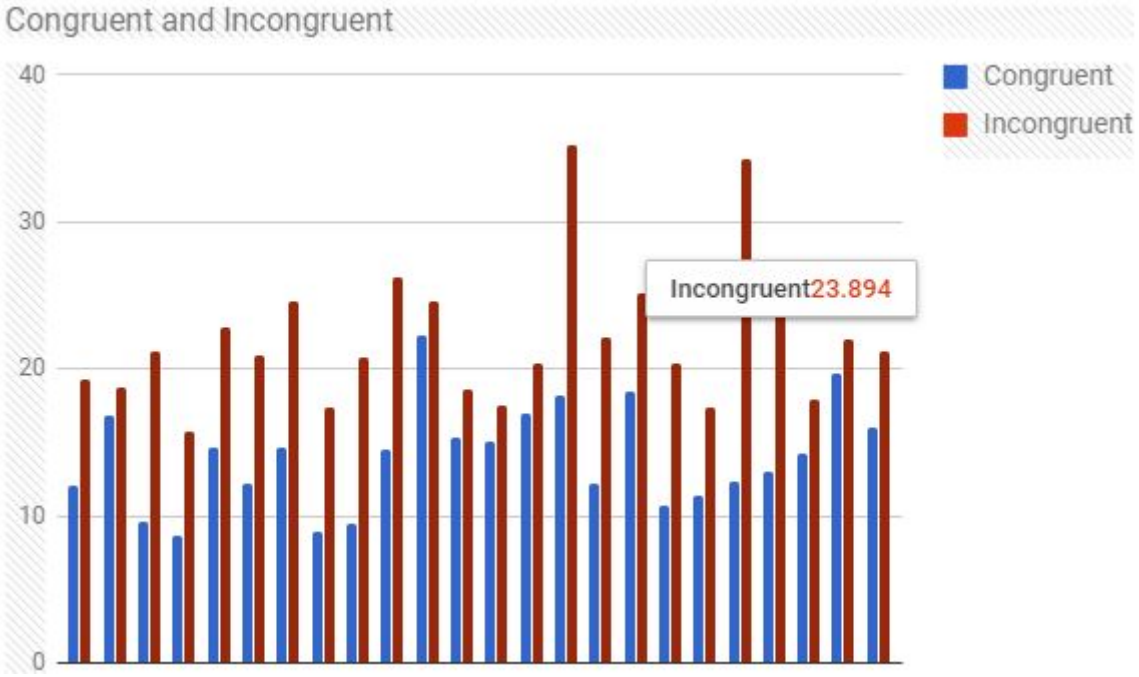


3. Report some descriptive statistics regarding this dataset. Include at least one measure of central tendency and at least one measure of variability.
The mean time taken in congruent test is 14.05s
The mean time taken in incongruent test is 22.02s

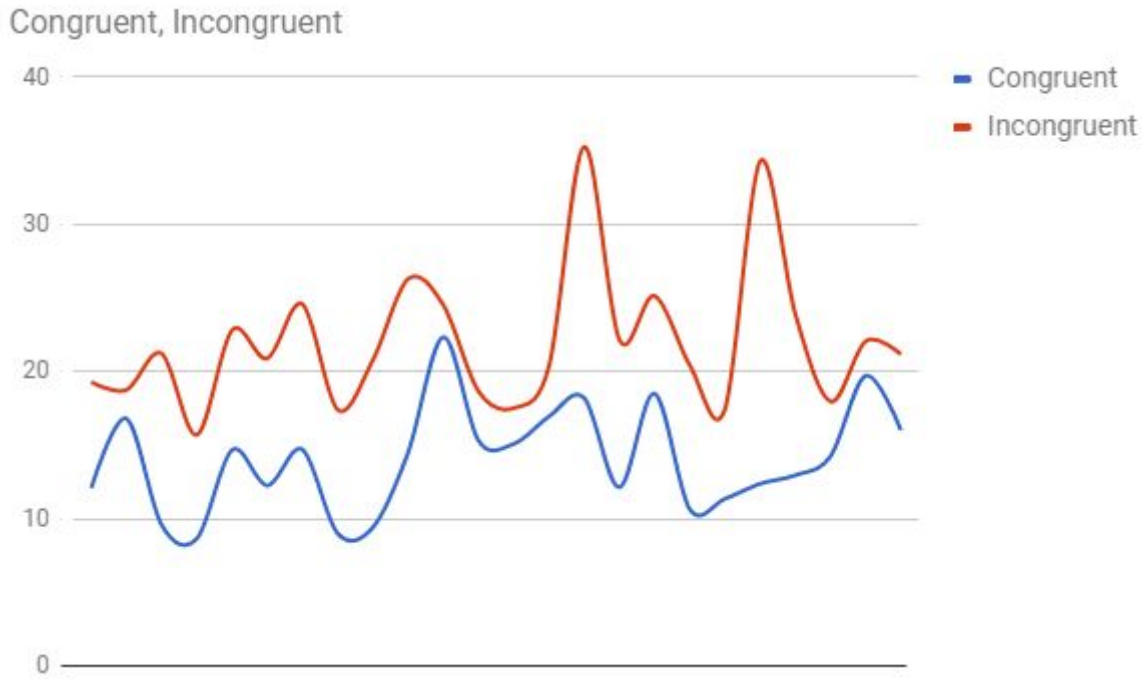
The Mean time difference (point of estimate) between incongruent test and congruent test is 7.96s
The Standard Deviation of difference in time taken in congruent and incongruent tests is 4.86s

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.

a) Column Chart



b) Smooth Line Chart



From above two charts we can easily see that for our sample (n=24) , time taken in incongruent condition is more than time taken in congruent condition.

5. Now, perform the statistical test and report your results. What is your 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?

t-tests ($\alpha = .05$**)**	$t(23) = 8.02$, SEM=0.99, p<.0001, one-tailed $t_{critical} = 1.71$
Confidence interval	Confidence interval on the mean difference; 95% CI = (5.91, 10.02)
Effect Size Measures	$d = 1.64$, $r^2 = .74$

The results are statistically significant. We reject the null hypothesis in favour of alternative hypothesis because $p < \alpha$.
People take significantly more time to read the colour in incongruent conditions than in congruent conditions.

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!

I think that our brain is more habitual to reading, so it gives more priority to reading words and hence there is a lag in recognizing colours when the words are different from ink colour.

Another task with similar effect could be to see the images of an animal and read the type of animal written below each image. When the type of the animal written does not match the image above, it should take longer and is more prone to errors than when the type of animal matches the image.

REFERENCES

Machine Learning Foundation Nanodegree Program, Part 2 - Statistics [Video lectures]. Retrieved from https://in.udacity.com/course/machine-learning-engineer-nanodegree--nd009-in-basic/