Do Males performs better than Female in Maths?

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2 Problem Statement

Suppose we want to know if males performs better than females at an engineering course?

Do answer this question, I recorded the marks of an engineering math test, and whether the student was male or female. This involves testing whether the sample means for the test among males and females in our sample are statistically different.

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3 Methodology

To test if there is significant difference between the performance of males and female groups we shall use Independent Samples t test.

The Independent Samples t Test is used because:

- We are comparing the means of two groups
- The dependent variable is continuous and independent variable is categorical
- Our data is a sample of a population

Additionally, we should also decide on a significance level (denoted alpha, α) before we perform our hypothesis tests. The significance level is the threshold we use to decide whether a test result is significant. In this case we are using $\alpha = 0.05$.

4 Our hypothesis

Our hypothesis for the Independent Samples t test can be expressed as follows:

H0: $\mu 1 = \mu 2$ ("there is no significant difference between the performance of male and female")

H1: $\mu 1 \neq \mu 2$("there is significant difference between the performance of male and female")

where $\mu 1$ and $\mu 2$ are the population means for male and female, respectively.

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5 Data

In the sample data, we will use two variables: gender and marks. The variable gender has values of either “F” (female) or "M" (male). It will function as the independent variable in this T test. The variable Marks is a numeric exams marks for the student, and it will function as the dependent variable. A sample of the data used in this test looks like this:

gender	marks
M	50
F	84
M	51
M	38
F	61

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6 Descriptive statistics

gender	N	Mean	SD	SE	95% Conf.	Interval
F	76.00	59.12	17.61	2.02	55.13	63.10
M	69.00	58.57	19.85	2.39	53.85	63.28

1. Females performs better than male with the mean marks at **59.12%** and **58.57%** respectively
2. There are more females enrolled for engineering maths course compared to the male students
3. To further compare the variance difference between then we visualize our results via box plot graph.

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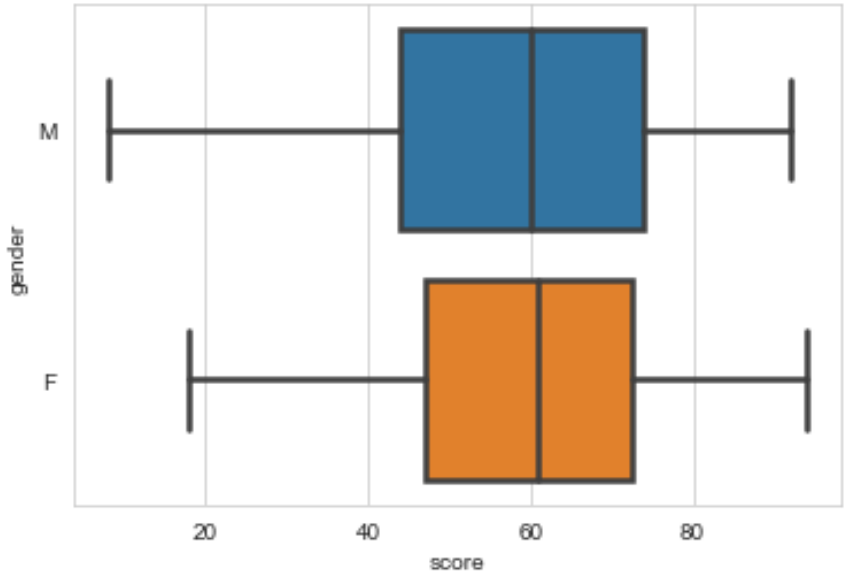
Box plot of student scores



There is a slight difference between the average score between the male and female students, the standard deviations are small for both groups, and the 95% confidence intervals do overlap so there should be no significant difference between these two groups- but we shall go ahead to confirm using t-test.

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7 Independent t-test

To conduct the independent t-test using methods from *researchpy* package using *researchpy.ttest()* method using the following line of code:

```
descriptives, results = rp.ttest(setosa['sepal_width'], versicolor['sepal_width'])
```

Independent t-test	results
Difference (score - score)	-0.5532
Degrees of freedom	143
t	-0.1779
Two side test p value	0.8591

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Interpretation of Results

The purpose of the current study was to test if there is a significant difference in the exams scores between the male and female students. Male's average score **(M= 58.57, SD= 19.85)** is wider and has slightly larger variation than females **(M= 59.12, SD= 17.61)**. An independent t-test was used to test for a difference. There is no statistically significant difference between the exam score of male and females **(t(143)= -0.1779, p = 0.8591)**.

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