Business Report

Advanced and Inferential Statistics

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Problem Statement 1 :-

A physiotherapist with a male football team is interested in studying the relationship between foot injuries and the positions at which the players play from the data collected.

	Striker	Forward	Attacking Midfielder	Winger	**Total**
Players Injured	45	56	24	20	**145**
Players Not Injured	32	38	11	9	**90**
Total	**77**	**94**	**35**	**29**	**235**

Probability that a randomly chosen player would suffer an injury?

The probability that a randomly chosen player would suffer an injury is of **145/235 or 0.62**.

Probability that a player is a forward or a winger?

The probability that a player is a forward or a winger is of **123/235 or 0.52.**

Probability that a randomly chosen player plays in a striker position and has a foot injury?

The probability that a randomly chosen player plays in a striker position and has a foot injury is of **45/235 or 0.19.**

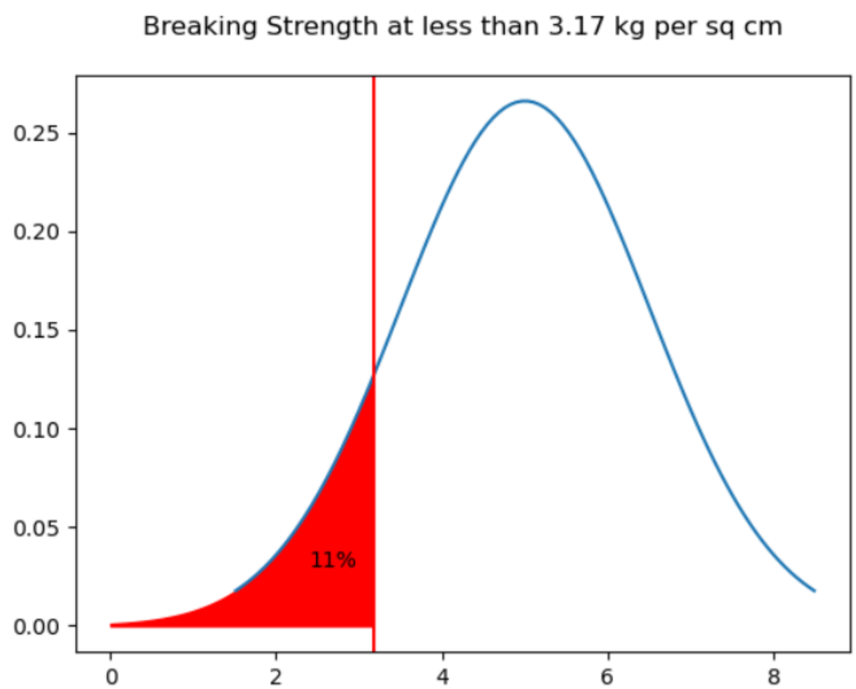
Probability that a randomly chosen injured player is a striker?

The probability that a randomly chosen injured player is a striker is of **45/145 or 0.31.**

Problem Statement 2:-

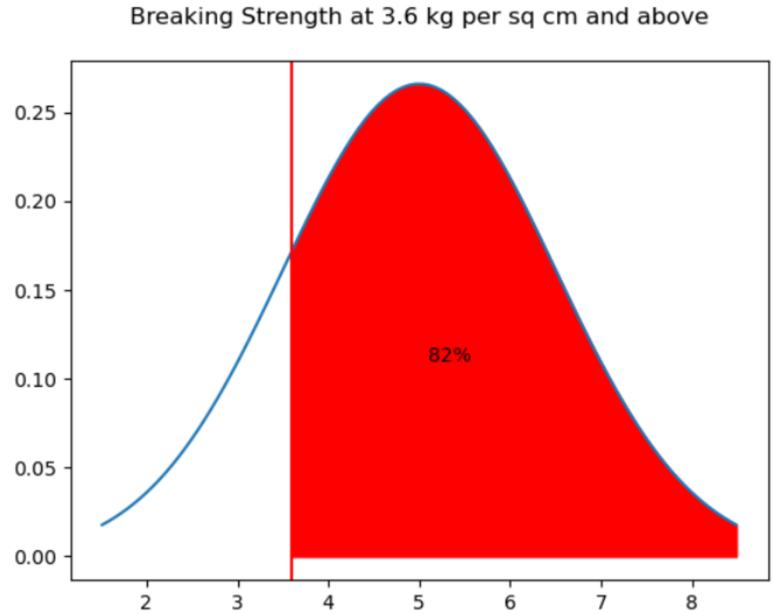
The breaking strength of gunny bags used for packaging cement is normally distributed with a mean of 5 kg per sq. centimeter and a standard deviation of 1.5 kg per sq. centimeter. The quality team of the cement company wants to know the following about the packaging material to better understand wastage or pilferage within the supply chain; Answer the questions below based on the given information; (Provide an appropriate visual representation of your answers, without which marks will be deducted)

What proportion of the gunny bags have a breaking strength of less than 3.17 kg per sq cm?



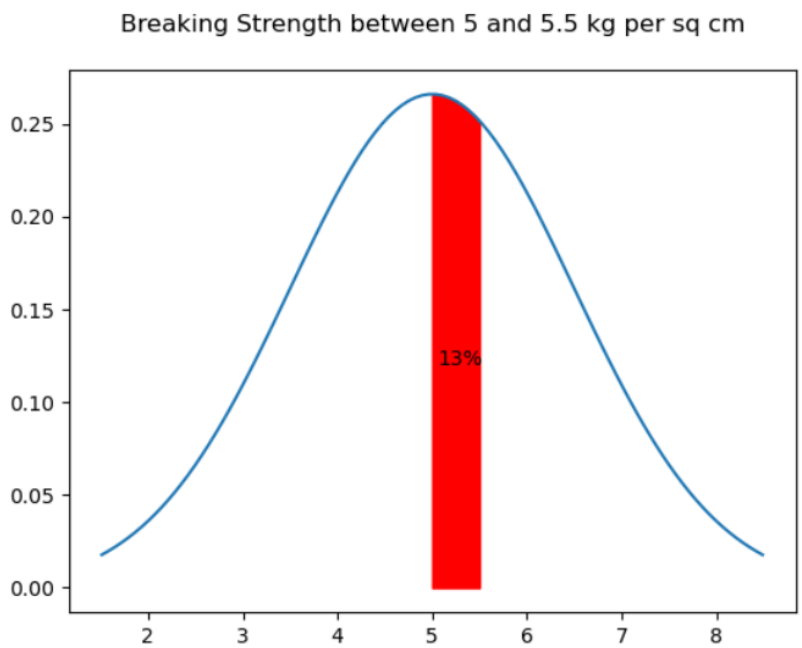
Proportion can be calculated using the Cumulative Distribution Function (cdf) of the Scipy library. Thus approximately **11%** of the gunny bags have a breaking strength of less than 3.17 kg per sq cm.

What proportion of the gunny bags have a breaking strength of at least 3.6 kg per sq cm.?



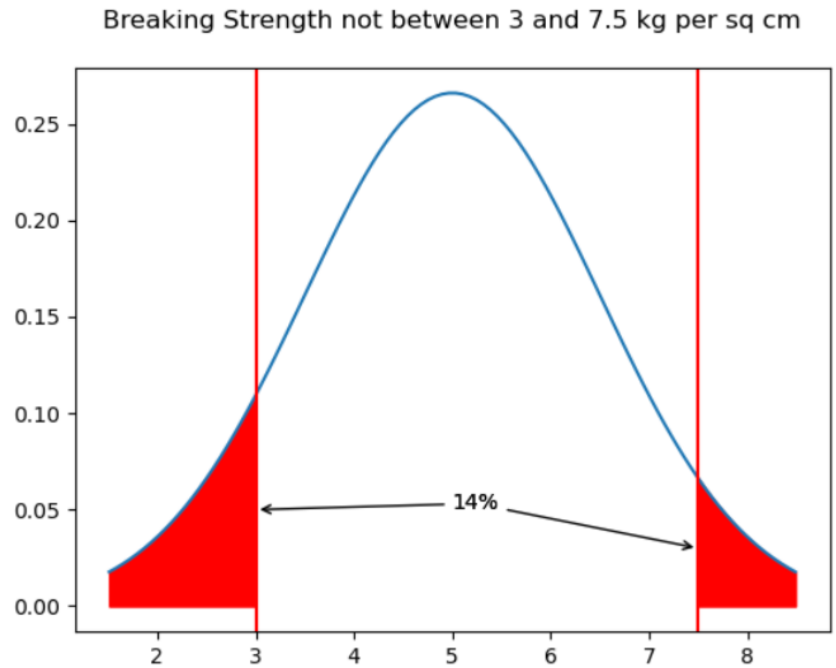
Approximately **82%** of the gunny bags have a breaking strength of at least 3.6 kg per sq cm

What proportion of the gunny bags have a breaking strength between 5 and 5.5 kg per sq cm.?



Approximately **13%** of the gunny bags have a breaking strength between 5 and 5.5 kg per sq cm

What proportion of the gunny bags have a breaking strength NOT between 3 and 7.5 kg per sq cm.?



Approximately **14%** of the gunny bags have a breaking strength not lying between 3 and 7.5 kg per sq cm

Problem Statement 3:-

Zingaro stone printing is a company that specializes in printing images or patterns on polished or unpolished stones. However, for the optimum level of printing of the image, the stone surface has to have a Brinell's hardness index of at least 150. Recently, Zingaro has received a batch of polished and unpolished stones from its clients. Use the data provided to answer the following (assuming a 5% significance level);

Zingaro has reason to believe that the unpolished stones may not be suitable for printing. Do you think Zingaro is justified in thinking so?

	Unpolished	Treated and Polished
0	164.481713	133.209393
1	154.307045	138.482771
2	129.861048	159.665201
3	159.096184	145.663528
4	135.256748	136.789227
5	161.820120	167.086582
6	149.455054	152.699641
7	135.714317	138.648766
8	102.004519	163.384427
9	89.482158	132.141726

	Unpolished	Treated and Polished
count	75.000000	75.000000
mean	134.110527	147.788117
std	33.041804	15.587355
min	48.406838	107.524167
25%	115.329753	138.268300
50%	135.597121	145.721322
75%	158.215098	157.373318
max	200.161313	192.272856

<u>Null Hypothesis (H_0)</u> = Mean of unpolished stones (μ_U) = 150

<u>Alternate Hypothesis (H_a)</u> = Mean of unpolished stones (μ_U) < 150

It can be observed that the population standard deviation is not known here, and our alternate hypothesis is if the mean of the unpolished stone is less than 150, hence we can conduct a one-tailed t-test for this problem statement.

```
One sample t test
t statistic: -4.164629601426757 p value: 4.171286997419652e-05
```

It can be seen that the p-value is much smaller than the 5% level of significance. So the statistical decision is to reject our null hypothesis at 5% level of significance in favour of the alternative hypothesis.

<u>Hence at 95% confidence level, it can be said that the mean Brinell's hardness index for the unpolished stones is less than 150. This indicates Zingaro is justified in thinking that the unpolished stones are not be suitable for printing.</u>

Are Mean hardness of the polished and unpolished stones the same?

Null Hypothesis (H_0) = Mean of unpolished stones (μ_u) = Mean of polished stones (μ_p)

Alternate Hypothesis (H_a) = Mean of unpolished stones (μ_u) ≠ Mean of polished stones (μ_p)

Since the population means of the two types of stones need to be compared and the population standard deviation is unknown, we can conduct a two-tailed unpaired t-test for this problem statement.

```
tstat -3.2422320501414053
P Value 0.0014655150194628353
```

It can be seen that p value is smaller than the 5% level of significance. So the statistical decision is to reject the null hypothesis at 5% level of significance in favour of the alternative hypothesis.

Hence at 95% confidence level, it can be said that the mean hardness for the polished and unpolished stones are not same.

Problem Statement 4:-

Dental implant data: The hardness of metal implants in dental cavities depends on multiple factors, such as the method of implant, the temperature at which the metal is treated, the alloy used as well as the dentists who may favour one method above another and may work better in his/her favourite method. The response is the variable of interest.

Does the hardness of implants vary depending on dentists?

Ans-

	Dentist	Method	Alloy	Temp	Response
0	1	1	1	1500	813
1	1	1	1	1600	792
2	1	1	1	1700	792
3	1	1	2	1500	907
4	1	1	2	1600	792
5	1	1	2	1700	835
6	1	2	1	1500	782
7	1	2	1	1600	698
8	1	2	1	1700	665
9	1	2	2	1500	1115

	Dentist	Method	Alloy	Temp	Response
count	90.000000	90.000000	90.000000	90.000000	90.000000
mean	3.000000	2.000000	1.500000	1600.000000	741.777778
std	1.422136	0.821071	0.502801	82.107083	145.767845
min	1.000000	1.000000	1.000000	1500.000000	289.000000
25%	2.000000	1.000000	1.000000	1500.000000	698.000000
50%	3.000000	2.000000	1.500000	1600.000000	767.000000
75%	4.000000	3.000000	2.000000	1700.000000	824.000000
max	5.000000	3.000000	2.000000	1700.000000	1115.000000

```
1    18
2    18
3    18
4    18
5    18
Name: Dentist, dtype: int64
```

There are 5 levels of the treatment dentist (1-5) with an equal sample size of 18 observations each. There are two types of alloys (1 and 2).

<u>Step 1 (Establishing the hypotheses)</u>

<u>For Alloy 1:</u>

<u>Null Hypothesis (H_0)</u> = The mean hardness of implants for alloy 1 is the same across the levels of the treatment dentist.

<u>Alternate Hypothesis (H_a)</u> = For at least one level of the treatment dentist for alloy 1, the mean hardness of implants is different.

For Alloy 2:

Null Hypothesis (H_0**)** = The mean hardness of implants for alloy 2 is the same across the levels of the treatment dentists.

Alternate Hypothesis (H_a**)** = For at least one level of treatment dentists for alloy 2, the mean hardness of implants is different.

Since a single treatment is involved in the problem statement, we will be conducting a way ANOVA test.

Step 2 (Checking the assumptions)

Shapiro's Test (Test for checking the normality distribution of the group population)

```
For alloy 1:
 Number of favourable dentist = 1:
 ShapiroResult(statistic=0.9113541841506958, pvalue=0.3254688084125519)
 Number of favourable dentist = 2:
 ShapiroResult(statistic=0.9642462134361267, pvalue=0.8415456414222717)
 Number of favourable dentist = 3:
 ShapiroResult(statistic=0.8721169233322144, pvalue=0.12953516840934753)
 Number of favourable dentist = 4:
 ShapiroResult(statistic=0.8368974328041077, pvalue=0.05333680287003517)
 Number of favourable dentist = 5:
 ShapiroResult(statistic=0.8534296751022339, pvalue=0.08127813786268234)

For alloy 2:
 Number of favourable dentist = 1:
 ShapiroResult(statistic=0.9039731621742249, pvalue=0.27593979239463806)
 Number of favourable dentist = 2:
 ShapiroResult(statistic=0.9392004013061523, pvalue=0.5735077857971191)
 Number of favourable dentist = 3:
 ShapiroResult(statistic=0.9340971112251282, pvalue=0.5213080644607544)
 Number of favourable dentist = 4:
 ShapiroResult(statistic=0.7613219022750854, pvalue=0.007332688197493553)
 Number of favourable dentist = 5:
 ShapiroResult(statistic=0.9131584167480469, pvalue=0.33861100673675537)
```

It can be observed that the p-values for almost all the levels of treatment across dentists for both the types of alloys are greater than the level of significance of 0.05. The p-value is low only for the 2nd alloy where the number of favourable dentists is 4. Hence there is enough evidence to conclude that for both the alloys, we cannot reject the null hypothesis for the number of favourable dentists. **Hence the group populations across both the alloys for the treatment of favourable dentists FOLLOW NORMAL DISTRIBUTIONS.**

Levene's Test (Test for checking the common variance of the group population)

```
For alloy 1:
 LeveneResult(statistic=1.3847146992797106, pvalue=0.2565537418543795)

For alloy 2:
 LeveneResult(statistic=1.4456166464566966, pvalue=0.23686777576324952)
```

It can be observed that the p-values for the treatment across dentists for both the types of alloys is more than the level of significance of 0.05. Hence there is enough evidence to conclude that for both the alloys, we cannot reject the null hypothesis for the number of favourable dentists. Hence the group populations for both the alloys for the treatment of favourable dentists HAVE EQUAL VARIANCES.

Step 3 (Conducting the hypothesis test)

```
For Alloy 1:
              df         sum_sq       mean_sq         F    PR(>F)
C(Dentist)   4.0  106683.688889  26670.922222  1.977112  0.116567
Residual    40.0  539593.555556  13489.838889       NaN       NaN

For Alloy 2:
              df        sum_sq       mean_sq         F    PR(>F)
C(Dentist)   4.0  5.679791e+04  14199.477778  0.524835  0.718031
Residual    40.0  1.082205e+06  27055.122222       NaN       NaN
```

It can be observed for both the alloys that the p-values are greater than the alpha value of 0.05 hence we fail to reject the null hypothesis. This concludes that the mean hardness of implants for both the alloys is the same and hence the MEAN HARDNESS OF IMPLANTS IS INDEPENDENT OF THE NUMBER OF FAVOURALE DENTISTS FOR BOTH THE ALLOYS.

How does the hardness of implants vary depending on methods?

```
1    30
2    30
3    30
Name: Method, dtype: int64
```

There are 3 levels of the treatment method (1-3) with an equal sample size of 30 observations each.

Step 1 (Establishing the hypotheses)

For Alloy 1:

Null Hypothesis (H_0) = The mean hardness of implants for alloy 1 is the same across the levels of the treatment method.

Alternate Hypothesis (H_a) = For at least one level of the treatment method for alloy 1, the mean hardness of implants is different.

For Alloy 2:

Null Hypothesis (H_0) = The mean hardness of implants for alloy 2 is the same across the levels of the treatment dentists.

Alternate Hypothesis (H_a) = For at least one level of treatment dentists for alloy 2, the mean hardness of implants is different.

Since a single treatment is involved in this problem statement, we will be conducting a way ANOVA test.

Step 2 (Checking the assumptions)

Shapiro's Test

```
For alloy 1:
 Method 1:
 ShapiroResult(statistic=0.9183822870254517, pvalue=0.18198540806770325)
 Method 2:
 ShapiroResult(statistic=0.9732585549354553, pvalue=0.9030335545539856)
 Method 3:
 ShapiroResult(statistic=0.9114548563957214, pvalue=0.14254699647426605)

For alloy 2:
 Method 1:
 ShapiroResult(statistic=0.963810384273529, pvalue=0.7582374811172485)
 Method 2:
 ShapiroResult(statistic=0.755793035030365, pvalue=0.001051110913977027)
 Method 3:
 ShapiroResult(statistic=0.9021322131156921, pvalue=0.1025901660323143)
```

It can be observed that the p-values for almost all the levels of the treatment methods for both the types of alloys are greater than the level of significance of 0.05. The p-value is low only for the 2nd alloy for method 2. Hence there is enough evidence to conclude that for both the alloys, we cannot reject the null hypothesis for the type of method. Hence the group populations across both the alloys for the treatment methods FOLLOW NORMAL DISTRIBUTIONS.

Levene's Test

```
For alloy 1:
 LeveneResult(statistic=6.52140454403598, pvalue=0.0034160381460233975)

For alloy 2:
 LeveneResult(statistic=3.349707184158617, pvalue=0.04469269939158668)
```

It can be observed that the p-values for the treatment methods for both the types of alloys is less than the level of significance of 0.05. Hence there is enough evidence to conclude that for both the alloys, we have to reject the null hypothesis for the different types of methods. Hence at least one of the group populations across both the alloys for the treatment methods DO NOT HAVE EQUAL VARIANCES.

Since the variances between the population groups are not equal, the Type I error rate (the probability of incorrectly rejecting a null hypothesis) for carrying out the one way ANOVA test can be affected for our problem statement. We can still carry out the one way ANOVA test however our test results may not be trustworthy as the F-statistic in ANOVA test relies on the assumption of equal variances which is untrue for our concerned group populations.

Step 3 (Conducting the hypothesis test)

```
For Alloy 1:
             df         sum_sq       mean_sq         F    PR(>F)
C(Method)   2.0  148472.177778  74236.088889  6.263327  0.004163
Residual   42.0  497805.066667  11852.501587       NaN       NaN

For Alloy 2:
             df    sum_sq        mean_sq        F    PR(>F)
C(Method)   2.0  499640.4  249820.200000  16.4108  0.000005
Residual   42.0  639362.4   15222.914286      NaN       NaN
```

It can be observed for both the alloys that the p-values are less than the alpha value of 0.05 hence we reject the null hypothesis. This means that the mean hardness of at least one of the implants for both the alloys is different. Hence the MEAN HARDNESS OF IMPLANTS IS DEPENDENT ON THE TYPE OF METHOD.

However, since the common variance assumption was not true for our group populations across the different levels of treatment for methods, this conclusion cannot be fully trusted.

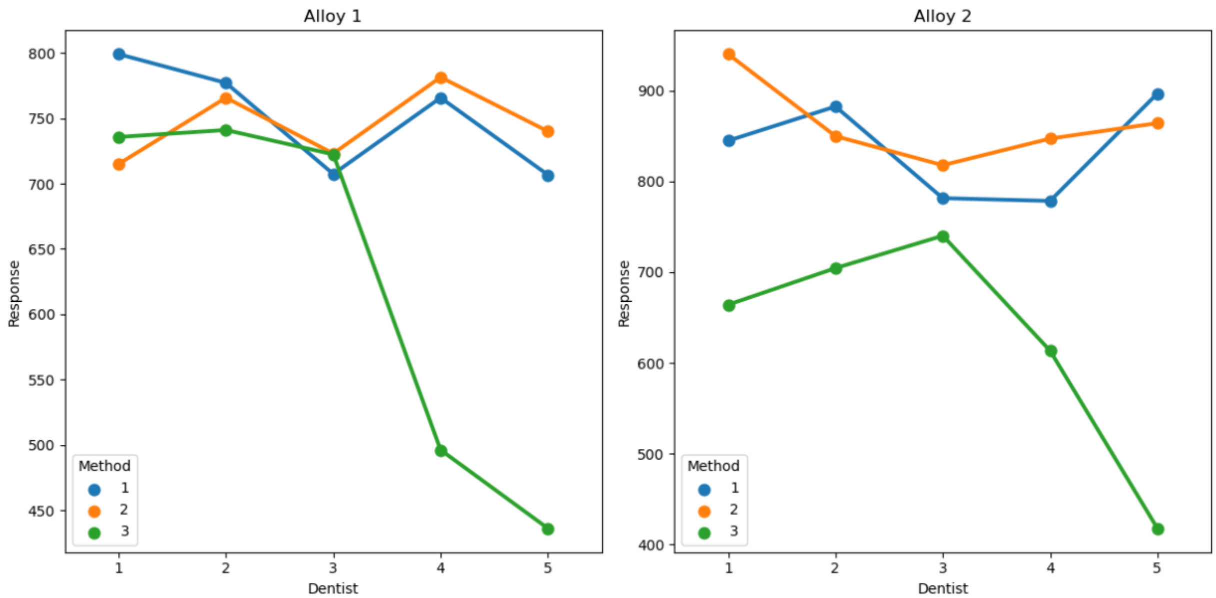
Step 4 (Conducting the Turkey's HSD test)

The Tukey's HSD test is conducted to find out which pair of groups have significantly different means.

```
For Alloy 1:

     Multiple Comparison of Means - Tukey HSD, FWER=0.05
============================================================
 group1   group2   meandiff p-adj    lower    upper   reject
------------------------------------------------------------
Method 1 Method 2   -6.1333  0.987  -102.714  90.4473  False
Method 1 Method 3    -124.8 0.0085 -221.3807 -28.2193   True
Method 2 Method 3 -118.6667 0.0128 -215.2473  -22.086   True
------------------------------------------------------------

For Alloy 2:

     Multiple Comparison of Means - Tukey HSD, FWER=0.05
============================================================
 group1   group2  meandiff p-adj    lower     upper   reject
------------------------------------------------------------
Method 1 Method 2     27.0 0.8212  -82.4546  136.4546  False
Method 1 Method 3   -208.8 0.0001 -318.2546  -99.3454   True
Method 2 Method 3   -235.8    0.0 -345.2546 -126.3454   True
------------------------------------------------------------
```

As per the Turkey's test, it can be observed that the p-values for both the alloys when comparing methods (1 and 3) and (2 and 3) are less than the alpha value of 0.05. Hence we reject the null hypothesis for these methods. This means that the mean hardness of the implants for the group populations for both the alloys for method 3 is different from the mean hardness of the methods 1 and 2.

What is the interaction effect between the dentist and method on the hardness of dental implants for each type of alloy?



It can be observed from the plot that there is a certain interaction between the two treatments namely the number of favourable dentists and the type of method used. The following inferences can be made from the interaction plot:

1. The mean hardness of the implants for both the alloys for method 1 and 2 ranges from 700-950
2. The mean hardness of the implants for both the alloys for method 3 ranges from 400-750
3. <u>The mean hardness of the implants for both the alloys decreases greatly for method 3 with the increasing number of favourable dentists</u>
4. <u>The mean hardness of the implants for both the alloys becomes relatively lower for method 3 when compared to methods 1 and 2 as the number of favourable dentists increases</u>

How does the hardness of implants vary depending on dentists and methods together?

Step 1 (Establishing the hypotheses)

For Alloy 1:

Null Hypothesis (H_0) = The mean hardness of implants for alloy 1 is the same across the levels of the treatment method and dentist.

Alternate Hypothesis (H_a) = For at least one level of the treatments method and dentist for alloy 1, the mean hardness of implants is different.

For Alloy 2:

Null Hypothesis (H_0) = The mean hardness of implants for alloy 2 is the same across the levels of the treatment method and dentist.

Alternate Hypothesis (H_a) = For at least one level of the treatments method and dentist for alloy 2, the mean hardness of implants is different.

Since two treatments are involved in this problem statement, we will be conducting a two way ANOVA test.

Step 2 (Checking the assumptions)

Shapiro's Test

```
For alloy 1:

Method 1:
 Dentist 1: ShapiroResult(statistic=0.7500000596046448, pvalue=-9.106917104872991e-07)
 Dentist 2: ShapiroResult(statistic=0.8256532549858093, pvalue=0.17733535170555115)
 Dentist 3: ShapiroResult(statistic=0.8036999702453613, pvalue=0.12336116284132004)
 Dentist 4: ShapiroResult(statistic=0.9834790229797363, pvalue=0.7538362145423889)
 Dentist 5: ShapiroResult(statistic=0.998848021030426, pvalue=0.9351651668548584)

Method 2:
 Dentist 1: ShapiroResult(statistic=0.9404369592666626, pvalue=0.5291318893432617)
 Dentist 2: ShapiroResult(statistic=0.926685631275177, pvalue=0.47633662819862366)
 Dentist 3: ShapiroResult(statistic=0.9708737730979919, pvalue=0.6724511384963989)
 Dentist 4: ShapiroResult(statistic=0.9929609298706055, pvalue=0.8395751118659973)
 Dentist 5: ShapiroResult(statistic=0.9778187274932861, pvalue=0.7144943475723267)

Method 2:
 Dentist 1: ShapiroResult(statistic=0.9829810261726379, pvalue=0.75013267993927)
 Dentist 2: ShapiroResult(statistic=0.9282682538032532, pvalue=0.482163667678833)
 Dentist 3: ShapiroResult(statistic=0.7500000596046448, pvalue=-9.106917104872991e-07)
 Dentist 4: ShapiroResult(statistic=0.999809205532074, pvalue=0.9736139178276062)
 Dentist 5: ShapiroResult(statistic=0.8961115479469299, pvalue=0.3732281029224396)
```

It can be observed that the p-values for almost all the levels of the treatments methods and dentists for alloy 1 are greater than the level of significance of 0.05. Hence there is enough evidence to conclude that for alloy 1, we cannot reject the null hypothesis for the treatments methods and dentists.

```
For alloy 2:

Method 1:
 Dentist 1: ShapiroResult(statistic=0.9792426824569702, pvalue=0.723876953125)
 Dentist 2: ShapiroResult(statistic=0.9998611211776733, pvalue=0.9774916172027588)
 Dentist 3: ShapiroResult(statistic=0.9412217140197754, pvalue=0.532307505607605)
 Dentist 4: ShapiroResult(statistic=0.9907512664794922, pvalue=0.8160430788993835)
 Dentist 5: ShapiroResult(statistic=0.9727578163146973, pvalue=0.6833236217498779)

Method 2:
 Dentist 1: ShapiroResult(statistic=0.8421052694320679, pvalue=0.219557985663414)
 Dentist 2: ShapiroResult(statistic=0.9095803499221802, pvalue=0.4166799485683441)
 Dentist 3: ShapiroResult(statistic=0.9723075032234192, pvalue=0.6806928515434265)
 Dentist 4: ShapiroResult(statistic=0.8995017409324646, pvalue=0.383916437625885)
 Dentist 5: ShapiroResult(statistic=0.8248403668403625, pvalue=0.1752912998199463)

Method 2:
 Dentist 1: ShapiroResult(statistic=0.8147925734519958, pvalue=0.15032446384429932)
 Dentist 2: ShapiroResult(statistic=0.9589211344718933, pvalue=0.6102096438407898)
 Dentist 3: ShapiroResult(statistic=0.9160097241401672, pvalue=0.4384445548057556)
 Dentist 4: ShapiroResult(statistic=0.8900450468063354, pvalue=0.35447922348976135)
 Dentist 5: ShapiroResult(statistic=0.9904982447624207, pvalue=0.8135352730751038)
```

It can be observed that the p-values for all the levels of the treatments methods and dentists for alloy 2 are greater than the level of significance of 0.05. Hence there is enough evidence to conclude that for alloy 2, we cannot reject the null hypothesis for the treatments methods and dentists.

Hence the group populations across both the alloys for the treatments methods and dentists FOLLOW NORMAL DISTRIBUTIONS.

Levene's Test

```
For alloy 1:
 LeveneResult(statistic=1.21885320778582, pvalue=0.3128166652989495)

For alloy 2:
 LeveneResult(statistic=0.6709660298340363, pvalue=0.7831735515657826)
```

It can be observed that the p-values for the treatments methods and dentists for both the types of alloys is more than the level of significance of 0.05. Hence there is enough evidence to conclude that for both the alloys, we cannot reject the null hypothesis for the treatments methods and dentists. Hence the group populations for both the alloys for the treatments methods and dentists HAVE EQUAL VARIANCES.

Step 3 (Conducting the hypothesis test)

```
For Alloy 1:
                        df         sum_sq       mean_sq          F    PR(>F)
C(Dentist)             4.0  106683.688889  26670.922222   3.899638  0.011484
C(Method)              2.0  148472.177778  74236.088889  10.854287  0.000284
C(Dentist):C(Method)   8.0  185941.377778  23242.672222   3.398383  0.006793
Residual              30.0  205180.000000   6839.333333        NaN       NaN

For Alloy 2:
                        df         sum_sq        mean_sq          F    PR(>F)
C(Dentist)             4.0   56797.911111   14199.477778   1.106152  0.371833
C(Method)              2.0  499640.400000  249820.200000  19.461218  0.000004
C(Dentist):C(Method)   8.0  197459.822222   24682.477778   1.922787  0.093234
Residual              30.0  385104.666667   12836.822222        NaN       NaN
```

It can be observed for both the alloys that the p-values for the treatments methods and dentists have slightly changed from before when they were analysed individually using one way ANOVA. This change can be contributed to the effect of their interaction with each other.

For Alloy 1, it can be observed that the p-values are less than the alpha value of 0.05 hence we reject the null hypothesis. This means that the mean hardness of the implants of the group populations of at least one of the implants is different. Hence the MEAN HARDNESS OF IMPLANTS FOR ALLOY 1 IS DEPENDENT ON THE TREATMENTS METHOD AND DENTIST.

For Alloy 2, it can be observed that the p-values are greater than the alpha value of 0.05 hence we fail to reject the null hypothesis. The p-value of only the methods treatment is less than the alpha value of 0.05 hence we reject the null hypothesis. This means that the mean hardness of the implants of the group populations of the treatments dentists and the combined interaction of dentists and methods is the same hence it is independent of these treatments. Additionally, it means that the mean hardness of the implants of the group populations of the treatment methods is different hence it is dependent upon the methods.

Step 4 (Conducting the Turkey's HSD test)

The following interaction levels are different for the treatments method and dentist for alloy 1:

Group 1	Group 2
Method 1 Dentist 1	Method 3 Dentist 4
Method 1 Dentist 1	Method 3 Dentist 5
Method 1 Dentist 2	Method 3 Dentist 4
Method 1 Dentist 2	Method 3 Dentist 5
Method 1 Dentist 3	Method 3 Dentist 5
Method 1 Dentist 4	Method 3 Dentist 4
Method 1 Dentist 4	Method 3 Dentist 5
Method 1 Dentist 5	Method 3 Dentist 5
Method 2 Dentist 1	Method 3 Dentist 5
Method 2 Dentist 2	Method 3 Dentist 4
Method 2 Dentist 2	Method 3 Dentist 5
Method 2 Dentist 3	Method 3 Dentist 5
Method 2 Dentist 4	Method 3 Dentist 4
Method 2 Dentist 4	Method 3 Dentist 5
Method 2 Dentist 5	Method 3 Dentist 5
Method 3 Dentist 1	Method 3 Dentist 5
Method 3 Dentist 2	Method 3 Dentist 5
Method 3 Dentist 3	Method 3 Dentist 5

The following interaction levels are different for the treatments method and dentist for alloy 2:

Group 1	Group 2
Method 1 Dentist 1	Method 3 Dentist 5
Method 1 Dentist 2	Method 3 Dentist 5
Method 1 Dentist 3	Method 3 Dentist 5
Method 1 Dentist 4	Method 3 Dentist 5
Method 1 Dentist 5	Method 3 Dentist 5
Method 1 Dentist 4	Method 3 Dentist 5
Method 2 Dentist 2	Method 3 Dentist 5
Method 1 Dentist 3	Method 3 Dentist 5
Method 2 Dentist 4	Method 3 Dentist 5
Method 2 Dentist 5	Method 3 Dentist 5