# MAT 243 Project Two Summary Report

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## Introduction: Problem Statement

The purpose of this project is to use the analytical skills to predict the performance of two teams based on the provided data. We will mainly be using regression models to analyze the performance of the teams to understand the explanatory variables. Additionally, we will be using hypothesis to aid us in the determination a given team skills. Once we have this information, we can provide our results to the managers to make better, informed decisions.

## Introduction: Your Team and the Assigned Team

In the Python script, you picked the same team and years that you picked for Project One. The assigned team and its range of years will be the same as in Project One as well.

Table 1. Information on the Teams

|  | **Name of Team** | **Years Picked** |
| --- | --- | --- |
| 1. Yours | Lakers | 2013 – 2015 |
| 2. Assigned | Bulls | 1996- 1998 |

The team I picked for this analysis is the Lakers from 2013 – 2015. The other team we will be testing is the Bulls from 1996 – 1998. We will be comparing these two teams in this project.

## Hypothesis Test for the Population Mean (I)

Suppose a relative skill level of 1340 represents a critically low skill level in the league. The management of your team has hypothesized that the average relative skill level of your team is greater than 1340. You tested this claim using a 5% level of significance. For this test, you assumed that the population standard deviation for relative skill level is unknown. Explain the steps you took to test this problem and interpret your results.

Table 2: Hypothesis Test for the Population Mean (I)

| **Statistic** | **Value** |
| --- | --- |
| Test Statistic | 19.80 |
| P-value | 0.0000 |

Hypothesis testing is a statistical technique that is used to test claims about a population mean. It is based on the idea that there are two possible hypotheses for a given problem, one of which is null and the other of which is alternative. The null hypothesis states that there isn't any relationship between different variables. The alternative hypothesis states that there is some type of relationship between different variables. The goal of this statistical technique will be to see if the null hypothesis can be rejected in favor of the alternative hypothesis at a specified significance level based on sample data. The level of significance is a number that tells you how likely it is that your results are accurate. It’s used to calculate the probability of making a type I error. A type I error is when you conclude that there is a difference between two groups when, there isn't. The higher the level of significance, the more likely it is to produce reliable results. The lower the level of significance, the less likely it is to produce reliable results. In this case the resulting p-value is lower than the level of significance, thus we can reject the null hypothesis.

## Hypothesis Test for the Population Mean (II)

Your team’s coach has hypothesized that average number of points scored by your team in the team’s years is less than 106 points. For this test, you assumed that the population standard deviation for points scored is unknown. You tested the claim using a 1% level of significance. Explain the steps you took to test this problem and interpret your results.

Table 3: Hypothesis Test for the Population Mean (II)

| **Statistic** | **Value** |
| --- | --- |
| Test Statistic | -6.91 |
| P-value | 0.000 |

The hypothesis test is a statistical procedure that helps us to answer the question: does a change in the population mean that there is a difference between two populations? In order to do this, we need to first identify the level of significance. This is how confident we are in our results. There are different levels of significance, such as 90%, 95% or 99%. The higher the level of significance, the more confident you are in your results. Next, we need to define what will happen if our null hypothesis is true and what will happen if our alternative hypothesis is true. Once we have done this, we can finally perform the test and find out which one was correct!

Based on the provided data the expectation is that the team will average 106 points. Based on the null and the alternate hypothesis the average cannot be greater or less than 106 points. For this case we will also reject the null hypothesis due to the p-value being lower than the level of significance. This information tells us that the significance is not based on the data.

## Hypothesis Test for the Population Proportion

Suppose the management claims that the proportion of games that your team wins when scoring 102 or more points is 0.90. You tested this claim using a 5% level of significance. Explain the steps you took to test this problem and interpret your results.

Table 4: Hypothesis Test for the Population Proportion

| **Statistic** | **Value** |
| --- | --- |
| Test Statistic | 0.00 |
| P-value | 1.0000 |

The null hypothesis is the default assumption that a population parameter is not different from a given value. It is the opposite of the alternative hypothesis. The null hypothesis is usually denoted as H0, and the alternative hypothesis as H1. The level of significance (or alpha) is used to determine how likely it will be for there to be an effect when in reality there was none. If we set alpha at 0.05, then we have a 95% chance of rejecting the null hypothesis if it's false, and a 5% chance of falsely concluding that there's an effect when there really isn't one. We can deduce that the teams are winning the games with 102 or more points about 90% of the games. In this case the p-value is higher than the level of significance, thus rejecting the null hypothesis. Because the team did not score 102 or more points the level of significance should be higher.

## Hypothesis Test for the Difference Between Two Population Means

You were asked to compare your team’s skill level (from its years) with the assigned team’s skill level (from the assigned time frame). You tested the claim that the skill level of your team is the same as the skill level of the assigned team, using a 1% level of significance.

| **Statistic** | **Value** |
| --- | --- |
| Test Statistic | 49.51 |
| P-value | 0.0000 |

Hypothesis testing is a statistical technique used to test claims about the difference between two population means. It is often used to determine whether there is a statistically significant difference between two populations. The null hypothesis states that the population means are equal, while the alternative hypothesis states that they are not equal. The null hypothesis is typically denoted with H0 and the alternative hypothesis with H1. To test this claim, we first calculate the probability of observing a result at least as extreme as what was observed if in fact there were no difference between the population means (the p-value). If this probability is small enough, we reject the null hypothesis and conclude that there is evidence of a difference between these two populations. We can interpret the first claim as the skill level of our team being the same as the assigned team. The alternative is the opposite. In this scenario, our p-value is less than the 1% level of significance, thus rejecting the null hypothesis. The two teams’ skills are not as close as expected with the Bulls sitting at 1739.8 and our team at 1440.49. We can clearly see that the Bulls are a much better team than the Lakers given the time frame selected.

## Conclusion

Statistical analyses are important because they help us understand the data and provide a more accurate representation of the population. The null hypothesis is the default assumption that there is no difference between two groups. The alternate hypothesis is that there is a difference between two groups. Statistical analyses are important because they help us understand the data and provide a more accurate representation of the population. They also help to identify trends and correlations that may not be apparent when looking at the raw data.

The results of this scenario allowed us to understand and compare the skills of two different teams and know which one is higher. With this analysis we can tell that the Bulls had better skills than the Lakers based on the years selected.

Frost, J. (2022, May 5). Statistical Hypothesis Testing Overview. Statistics By Jim. Retrieved October 9, 2022, from https://statisticsbyjim.com/hypothesis-testing/statistical-hypothesis-testing-overview/