# MAT 243 Project One Summary Report

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In this report, we want to analyze the historical data of a basketball team to find patterns and insights that can help improve the team's performance. This involves using descriptive statistics and data visualization techniques to understand the distributions of key variables associated with the team’s performance. To do this, we are using a historical dataset that includes all the NBA teams’ data. This dataset has been cleaned, which means it is ready for analysis. Lastly, we will be using some statistical methods to analyze our dataset. Such statistical methods are performing descriptive statistics, data visualization techniques, and confidence intervals. These methods will be applied using the Python programming language. Our main goal is that this report will help management make informed decisions that can improve our team’s performance.

The team I picked for this analysis was the Golden State Warriors during the years 2013 to 2015. On the other hand, for the comparative study, I was assigned the amazing Chicago Bulls. The range of years assigned to me for the comparative study is 1996 to 1998. The table below contains the information on both teams that I will be comparing.

Table 1. Information on the Teams

|  | **Name of Team** | **Assigned Years** |
| --- | --- | --- |
| 1. Yours | Golden State Warriors | 2013 – 2015 |
| 2. Assigned | Chicago Bulls | 1996 – 1998 |

Data visualization is a crucial tool for studying data distributions and trends. Data visualization techniques like histograms, box plots, and others allow analysts to visually inspect the distribution of variables. This helps in identifying patterns because our brains can understand the data more clearly. In other words, It allows us to see patterns, trends, and outliers that might otherwise go unnoticed. For this case, I used a histogram to show the points scored by the Golden State Warriors from 2013 to 2015.

A blue and white building

Description automatically generated

I used a histogram because it provides a clear representation of the distribution of points scored by the Golden State Warriors during the 2013 - 2015 period. It shows the frequency of different point ranges, allowing for easy comparison of the distribution.

After visually inspecting the histogram, it appears that the distribution of points scored by the Golden State Warriors is approximately normally distributed, with a peak around the center. This shows that the team's performance in terms of points scored follows a typical distribution pattern, with most games falling within a certain range of points.

Now that we have the histogram for the Golden State Warriors, we need to compare it to the Chicago Bulls histogram, so we can see the difference in their data. See the figure below.

A blue and white background

Description automatically generated

I picked this plot for the same reason I picked the previous one, histograms provide a clear representation of how data is distributed across different intervals. Each bar in the histogram represents the frequency of points scored falling within a specific range. From this histogram, I can say that the points scored by the Bulls are concentrated around 100 - 110 points, with fewer games at the extremes of very high or very low scoring. This suggests that the Bulls’ scoring tended to be consistent, with the occasional situation of high-scoring or low-scoring games.

Data visualization is an effective tool for comparing two different data distributions because it allows us to visualize their characteristics, similarities, and differences. In this case, I used a histogram to compare both teams' distribution of points. See the figure below.

A graph of a mountain

Description automatically generated with medium confidence

I chose a histogram because it provides a clear and intuitive representation of the distribution shape and frequency of points of both teams. I believe this is essential for understanding how the scores are distributed across different ranges for each team. Based on the histogram, it appears that the Chicago Bulls scored higher points than the Golden State Warriors. Also, the Bulls seem to have a wider range of points scored, whereas the Warriors’ points are more clustered together. This suggests that the Bulls have more variability in their scoring.

Table 2. Descriptive Statistics for Points Scored by the Warriors in Home Games

| **Statistics** | **Values** |
| --- | --- |
| Mean | 106.62 |
| Median | 106.0 |
| Variance | 136.76 |
| Standard Deviation | 11.69 |

Measures of central tendency and variability allow for comparison between different data sets. For example, comparing the means and standard deviations of scores from the two different teams can help identify which team performed better and which had more consistent performance.

Each statistic tells us something different about the points scored by the Warriors during the 2013 to 2015 period. The mean represents the average number of points scored by the Warriors in home games which is 106.62. The median is the “middle” value of all the points scored when the data is ordered from least to greatest. In this case, the median is 106.0. The variance (136.76) represents how spread out the data is from the mean. Since we have a high variance, this indicates that the points scored are more spread out. Lastly, The standard deviation (11.69) also represents how spread out the data is relative to the mean.

In this case, since the mean (106.62) has almost the same values as the median (106.0), the skew is bell-shaped. Since the distribution is bell-shaped, the mean is the most appropriate measure to use.

## Table 3. Descriptive Statistics for Points Scored by the Warriors in Away Games

| **Statistics** | **Value** |
| --- | --- |
| Mean | 103.63 |
| Median | 104.0 |
| Variance | 130.77 |
| Standard Deviation | 11.44 |

Similar to what was explained above, each statistic tells us something different about the team’s performance. The mean (103.63) represents the average points scored by the Warriors in away games. The median points scored is 104.0. The median is the middle value in a data set when it is ordered from least to greatest. The variance is 130.77, and it measures the dispersion of the points scored around the mean. The standard deviation (11.44) provides a measure of the average distance of each score from the mean.

In this case, the mean (103.63) is slightly less than the median (104.0), suggesting a very slight left skew. However, the difference is minimal, indicating that the distribution might be close to symmetric or bell-shaped. Since the difference is minimal, we can consider it bell-shaped meaning that the best way to represent the center of the distribution is the mean.

From the information above, we can determine if the team performed better in away or in home games. The mean points scored in home games (106.62) is higher than the mean points scored in away games (103.63). This indicates that, on average, the Warriors score more points when playing at home compared to when they are playing away. Therefore, based on the mean points scored, the Warriors perform better in home games. On the other hand, the standard deviation for home games is 11.69, while the standard deviation for away games is 11.44. These values are relatively close, indicating that the variability or dispersion of points scored in both home and away games is similar.

Table 4. Confidence Interval for Average Relative Skill of Teams in Warriors’ Years

| **Confidence Level (%)** | **Confidence Interval** |
| --- | --- |
| 95% | (1502.02 , 1507.18) |

Confidence intervals help estimate population measures of central tendency (like mean or median). They provide a range of values where the true population value likely lies. The wider the confidence interval, the greater the uncertainty in the estimate. Based on this data, we can be 95% confident that the average skill level of NBA teams between 2013 and 2015 was very close, somewhere between 1502 and 1507. This suggests a competitive league with teams having relatively similar overall skills on average. On the other hand, using a higher confidence level, like 99%, would widen the range of possible average skill level scores. This increased certainty comes at the cost of less precision in pinpointing the exact average skill level.

The probability of a team having a lower relative skill level than the Golden State Warriors between 2013 and 2015 is 0.818 or 81.8%. This means there's an 81.8% chance that another team had a lower skill level compared to the Warriors during that period. This means that it is not unusual for a team to have a skill level less than the Warriors during this period.

Table 5. Confidence Interval for Average Relative Skill of Teams in Chicago Bulls Years

| **Confidence Level (%)** | **Confidence Interval** |
| --- | --- |
| 95% | (1487.66 , 1493.65) |

The 95% confidence interval of (1487.66, 1493.65) for the average relative skill of teams during the Chicago Bulls' dominant years of 1996 to 1998 indicates a well-defined range in which the true average skill level lies. If we had used a different confidence level, such as 99%, the interval would be wider compared to the 95% confidence interval.

The comparison of the confidence intervals for the average relative skill of NBA teams during 1996-1998 and 2013-2015 reveals that the teams in the latter period were, on average, more skilled. This signifies an overall elevation in the competitive standard and performance levels in the NBA over these years. As a result, teams and players from the 2013-2015 period had to operate at a higher level of relative skill to succeed, indicating a progression in the quality of basketball over time.

To conclude this report, the analyses performed are important because they can help the Golden State Warriors management understand their team's performance compared to a historic big team like the Chicago Bulls from 1996 to 1998 and the league overall. This can be used to make informed decisions to improve the Warriors' game.

Lastly, these results mean that the Warriors can focus on improving their away game performance and develop strategies to handle high-scoring opponents like the Bulls. They should also consider the overall increase in skill level across the league when making plans for future seasons.