# MAT 243 Project One Summary Report

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## Introduction: Problem Statement

The purpose of this analysis is to look at key performance metrics to allow the coach to make better decisions to improve the team’s performance. I will be looking at the points scored in a game, a measure of the relative skill level of the team over a two-year period. I will also look at home games versus away games and will find the mean, median, variance and standard deviations. To help visualize the data I will provide different graphs such as a histogram and boxplot. Lastly, I will provide confidence intervals that look at the average relative skill of teams during different time periods.

## Introduction: Your Team and the Assigned Team

Table 1. Information on the Teams

| **Name of Team** | **Assigned Years** |
| --- | --- |
| Denver Nuggets | 2013 - 2015 |
| Chicago Bulls | 1996-1998 |

## Data Visualization: Points Scored by Your Team

A blue and white background

Description automatically generated

Data visualization can help us understand large amounts of data that would otherwise be difficult to read in a table or otherwise. If the correct type of graph is chosen it can help convey trends or comparisons in a readable format. The histogram was picked because it shows the range and frequency of points scored per game. You can easily see there is a normal distribution amongst points scored in a game that is centered around 105. This means that in most of their games they scored between 95 and 115 points. They have some outlier games where they scored about 70 points, or on the other end have a couple games they were scoring around 140 points.

## Data Visualization: Points Scored by the Assigned Team

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Description automatically generated

A histogram shows the range and frequency of points scored per game as it did with the Denver Nuggets in 2013-2015. The histogram shows the Bulls had a multimodal distribution between 1996-1998, as there are a few modes that stand out (roughly 86, 98, 105 and 111).

## Data Visualization: Comparing the Two Teams

A blue and orange rectangular shapes

Description automatically generated

Data visualization can be used to compare two separate data distributions by overlaying the data or putting it side by side for comparison. Doing this can help show different critical values of the data and make easy comparisons. The boxplot above was chosen because it shows the range, the median and outliers for both teams side by side. It allows for easy comparison and gives accurate readings for average points scored per game. When looking at the boxplot, you can see that the Nuggets, on average, scored more points than the Bulls did. Their median is slightly higher as is their Q3 upper limit. The Bulls have a lower Q1 in comparison to the Nuggets. The diamonds represent any outliers, which only the Nuggets had, one being below 70, and two that were above 130.

## Descriptive Statistics: Points Scored By Your Team in Home Games

Table 2. Descriptive Statistics for Points Scored by Your Team in Home Games

| **Statistic** | **Value** |
| --- | --- |
| Mean | 106.20 |
| Median | 106.00 |
| Variance | 147.80 |
| Standard Deviation | 12.16 |

The measures of central tendency are used to analyze a data distribution by seeing how closely the mean and median are, to get a sense of the common output or result. They show where the center of the data is. Variability is used to see how often the output or results are from the middle, and how big of a difference it can be. In the data from the Nuggets home games, the mean is 106.20, so on average they score 106 points per game. The median is the halfway point in all the data, so half of the data is less than 106, while the other half is greater than. The standard deviation is 12.16 which means that most games will be within 12.16 points of the mean of 106.20. The variance is 147.80 so the graph itself would not be very tightly grouped but have a spread to it. Based on all the data gathered, we can say that the graph would be normally distributed, which would be represented by a bell-shaped. Based on this, the mean would be the best measure of central tendency to use to represent the center of the data.

## Descriptive Statistics: Points Scored By Your Team in Away Games

Table 3. Descriptive Statistics for Points Scored by Your Team in Away Games

| **Statistic** | **Value** |
| --- | --- |
| *Mean* | *101.80* |
| *Median* | *103.00* |
| *Variance* | *148.33* |
| *Standard Deviation* | *12.18* |

For the Nuggets playing away games, the mean was 101.80 so they will typically score 101 points per game. The median is 103.00, which again is the halfway point of all the data for the points scored per game of the 2013-2015 seasons. The standard deviation is 12.18, so in most of the games they will score between 89.62-113.98 points per game. The variance is 148.33, so the data will be somewhat spread out. There would be a right skew since the median is 1.20 higher than the mean. Based on the data of home versus away games, the Nuggets play slightly better when they are home. The home mean is 106.20 and the away mean is 101.80, so they typically score 4.4 more points when at home. The standard deviation at home is 12.16 and the standard deviation is 12.18, so both are very close compared to one another. From this we can say for most home games they will score within 12.16 points of 106.20 and for most away games they will score within 12.18 points of 101.80.

## Confidence Intervals for the Average Relative Skill of All Teams in Your Team’s Years

Table 4. Confidence Interval for Average Relative Skill of Teams in Your Team’s Years

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

Confidence intervals are used to estimate the probability that a specific parameter falls within an interval a given percentage of time. The average relative skill of teams between 2013-2015 falls between 1502.02-1507.18 95% of the time. If the confidence level went from 95% to 99%, the interval would increase, and if it went down to 90% the interval would decrease. The probability that another team has a relative skill level less than the Nuggets is 57.86%. This would not be unusual then since they are slightly above average in comparison to the league.

## Confidence Intervals for the Average Relative Skill of All Teams in the Assigned Team’s Years

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

The average relative skill for the teams in the NBA in 1996-1998 fell between 1487.66-1493.65 95% of the time. If the confidence level was 90% the range would be less, and if it was 99% the range would be greater. The confidence interval of the 96-98 era compared to the 13-15 era shows that teams have gotten better over time. The teams on the higher end from the 90s would have likely been less skilled in comparison to the lower skilled teams in the 2013-2015 era.

## Conclusion

The Denver Nuggets between 2013-2015 had a mean of 106.20 points per home game and a median of 106.00. They played consistently while at home based on these numbers, which can also be seen by the standard deviation of only 12.16. When they played away, they had a mean and median of 101.80 and 103.00 points per game. They scored slightly less points on average when on the road and had a fraction more variance (148.33) compared to home games (147.80). The confidence interval at 95% found the league’s average skill score was between 1502.02 – 1507.18. The CDF was then used to see where the Nuggets fell in comparison. It was found that they had an average relative skill score higher than 57.86% of all teams, which means they were just above average.

All of this is used to show performance metrics of the Nuggets, looking at average points scored in home games versus away games. It looked at the average skill level of the team and see where they truly rank in comparison to the other teams in the NBA. All of this can be used moving forward to see what changes need to be made to make the team better. This data could be used to see that they can improve their scoring when playing away games to help maximize their potential. It can also be used to see that they might need to get some higher skill players if they want to be a standout team.