

# Numerical Methods (MAT 370) - Interpolation

James Pack

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# 1 Introduction

One of the most popular forms of entertainment in the United States is professional sports. Although COVID-19 interrupted the regular schedule of sporting events, over the summer of 2020 the National Basketball Association created an isolated environment for continued games of the best teams so that competition for the championship could continue in 2020. During this time, many of the athletes have demonstrated incredible performances, carrying their teams throughout the playoffs. One of the most notable of these players is Lebron James, an athlete that many argue is the greatest basketball player of all time. However, one of the main arguments against this accolade for James is his lack of championships when compared to other greats. As he makes his tenth NBA Finals appearance in the coming weeks, one question arises in the minds of many fans of the sport: Can Lebron James carry his team to victory and the Lakers' 17th championship?

## 2 The Problem

Lebron James is well known for his success on teams with few other star athletes. However, with his current team this is not the case; Anthony Davis, another all-star, is a teammate, as well as former superstars Rajon Rondo and Dwight Howard. The problem that arises here asks if James' attempts to carry his team hurts or helps his team find success. For the sake of simplicity, success of the team is measured by the point differential for the Lakers (a positive integer for a win, negative for a loss) while James' contribution is measured through the % of total team points he scored. Understanding the relationship between his contribution and the team's success shows how his play in the Finals will influence the outcome of the game.

## 3 Methodology

Using the statistics recorded from the 15 games played so far in the 2020 NBA Playoffs found on the ESPN NBA scoreboard online, the team point differential and % of points scored by Lebron James were loaded into MatLab. Then, a cubic spline was created to approximate the relationship between the two variables. The cubic spline was chosen because the number of data points caused severe oscillation in other interpolation methods, while cubic splines constructed more accurate approximations between each data point and so did not introduce unnecessary error. The domain was limited based on the assumption that any given player would not score more than 40% of a team's points in a normal game, seen in Figure 1. For games in which a single player scored more than 40% of a team's points, a separate model would likely need to be created due to the unusual nature of such performances.

## 4 Results

Although each end of the domain considered had near-impossible values (the Lakers are unlikely to win by more than 40 points with little to no contribution from their best player), it is important to note that almost all values were positive on this curve (see Figure 2) for the most common values of James' contributions and that the extreme values at the extremes of the data are likely caused by the construction of the polynomials "outside" of the data points (less than the minimum data point and greater than the maximum data) because James nearly always contributes around 10% of the team's points and rarely contributes more than 30%. The area of most interest is between 0.2 and 0.3, where the bulk of the data lies. Three data points, representing three of the four Lakers losses during the 2020 playoffs, are responsible for the curve oscillating rapidly up and down around 0.25. While the majority of the curve is positive in this range with one peak exceeding an estimated 40 point differential, these oscillations suggest that only accounting for James' scoring is insufficient for accurately predicting the success of the Los Angeles Lakers.

## 5 Future Work

For the reasons this model yields results that avid basketball fans may expect, this is far from a complete model as it only takes into account the scoring of LeBron James while ignoring any other ways in which he may impact the game. A more complete model would likely use ratings like the Usage rating (USG) and a defensive measure to better encapsulate the impact James has on games. Additionally, data spread more evenly across the possible contributions he could give would help to reduce the oscillation observed (see gaps in distribution in Figure 1). Future work would account for both of these shortcomings to better approximate James' impact.

## 6 Figures

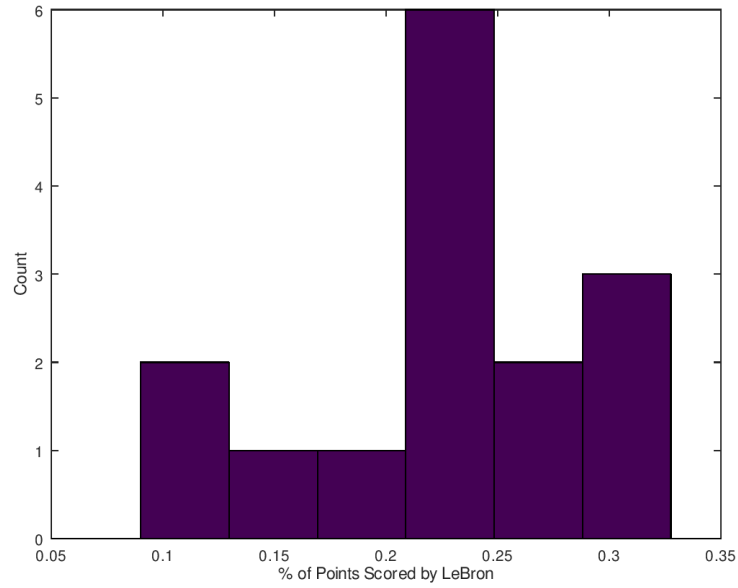


Figure 1: The distribution of LeBron James' contributions to Laker's score

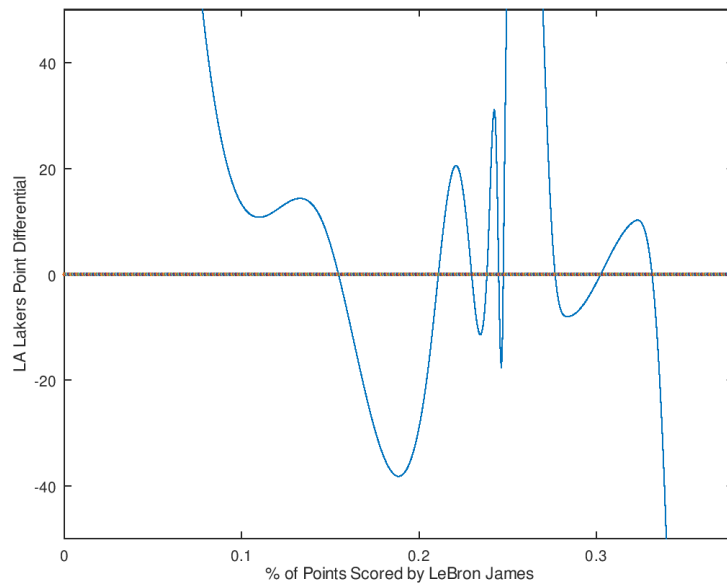


Figure 2: The constructed cubic spline on the domain  $[0, .50]$