**1 Introduction：**

**1.1 My Research Question**

For my final project, my goal was to examine how LeBron James adjusted his offensive and defensive options to win in close games in every season of his career. This survey has important implications for LeBron James fans. Throughout James' career, he has faced different challenges at different stages. In the early stage, due to the lack of strong teammates, James may need to go all out to win. In the mid-term, with the emergence of more talented teammates, he has to consider how to distribute the ball effectively, which may mean that he will reduce the proportion of his holding the ball, reduce the proportion of his offense, and become more involved in defense, and Make some more conductive balls. In the later stages, as he grows older, he is no longer able to participate in every offensive and defensive round with all his strength. In order to save his energy to fight for victory, he may reduce his defensive performance or even deliberately let his opponent score. Therefore, it becomes crucial to study the performance of LeBron James, taking into account different situations at different stages.

**1.2 My research hypothesis**

My hypothesis is: in the early stage, LeBron James' offensive and defensive performance will be significantly improved when he wins than when he loses; in the mid-term stage (starting from his time with the Heat), his various statistics may be compared to his In the early stage, there will be a decline, but the offensive and defensive data will still be significantly improved when winning than when losing; in the later stage, I expect that the offensive end will be significantly improved when winning, but the defensive end may not be as good as losing.

**1.3 The variables I select**

For the offensive end, I chose several variables, they are:

Points per game per season, assists per game per season, field goal percentage per season (the number of two-point and three-point field goals you make divided by your total field goal attempts), three-point field goal percentage per season, per season Average free throw percentage per game, and average number of turnovers per game (for this variable, we want it to be as small as possible, because it means that your turnovers give the opponent too many offensive opportunities).

For the defensive end, I chose several variables, which are:

Defensive rebounds per game per season (rebounds you get on the other team’s offensive possessions), offensive rebounds per game per season (rebounds you get on your own offensive possessions), this stat is usually more meaningful because it means you get more more second-chance opportunities), steals per game per season, and blocks per game per season.

**2 Methodology**

In this project, we employ the R Shiny application framework alongside ggplot2, a powerful visualization package, to explore and present the performance data of LeBron James across different seasons and team engagements. Our methodology is divided into four distinct groups of analysis, each leveraging unique visualization techniques to elucidate patterns and insights within the data.

**2.1. Radar Charts for Offensive and Defensive Performance Analysis**

For the offensive and defensive performance analysis, we utilize radar charts to provide a holistic view of LeBron James' gameplay attributes. Radar charts are particularly effective for comparing multiple variables, such as field goal percentage, free throw percentage, assists, and points, which are crucial for offensive analysis, as well as offensive rebounds, defensive rebounds, steals, and blocks for defensive analysis. This multidimensional comparison allows us to encapsulate LeBron James' performance across various aspects of the game within a single, cohesive visual representation.

The data is derived from each season's average statistics. I then standardized these variables to a scale of 0-100 (0 representing the career-low for that season's variable, and 100 representing the career-high).

**2.2. Line and Point Plots for Seasonal Performance Trends**

To analyze LeBron James' performance across different seasons, we employ line and point plots. This approach is chosen to track the progression or regression of specific statistical metrics over time, such as points per game, assists, or rebounds. The line plot connects each season's average performance metric, highlighting trends and shifts in performance levels. Simultaneously, point plots overlay the line graph to pinpoint the exact values for each season, offering a detailed view of the year-on-year performance.

**2. 3. Box Plots for Comparative Win-Loss Analysis**

For the win-loss comparative analysis, box plots are utilized to depict the distribution of points scored by LeBron James in games categorized by outcomes (wins vs. losses). Box plots provide a clear summary of the central tendency, dispersion, and skewness of the points distribution, alongside potential outliers. This visualization technique enables a straightforward comparison between LeBron James' scoring impact in victories compared to defeats, highlighting whether his scoring significantly influences game outcomes.

**2.4. Shiny Interactive Visualizations for User-Driven Analysis**

The Shiny application framework is employed to create an interactive web application that allows users to dynamically explore LeBron James' performance data. Users can select specific performance metrics, seasons, or team engagements to visualize, enabling a personalized analysis experience. This interactivity is facilitated through UI elements such as radio buttons, slider inputs, and select inputs, which control the rendering of the ggplot2 visualizations based on user preferences. The use of Shiny enhances the accessibility and engagement of the data analysis, encouraging users to delve deeper into the datasets and discover insights that static visualizations might not readily reveal.

In summary, the combination of Shiny for interactivity and ggplot2 for advanced data visualization offers a comprehensive and user-friendly platform for analyzing and presenting sports performance data. Through the application of radar charts, line and point plots, and box plots, we can effectively convey complex data patterns and insights in a visually appealing and understandable manner, catering to both seasoned analysts and casual enthusiasts alike.

**3 Discussion**

**3.1 what has the audience learned from my work**

First, analyzing LeBron James's overall career, it's apparent that his scoring significantly increases when lacking strong teammates. This phenomenon is particularly noticeable in the 2006 season, due to the absence of All-Star teammates, and in the 2021 season, following a trade for Westbrook which led to a lack of team depth and poor performance, requiring James to take on more offensive responsibilities. Generally, his shooting percentages peaked in the second stage of his career before declining, likely due to improved skills initially boosting his accuracy, followed by a decrease in offensive involvement. Conversely, James's assists have steadily increased, suggesting that assists are a less physically demanding way for him to contribute offensively. His defensive performance similarly peaked and then declined.

Looking more closely at games with close scores, in his early career with the Cavaliers, James's offensive performance was significantly better in wins than losses, especially in his second season, aligning with the hypothesis that he needed to fully engage offensively due to insufficient team support. However, the 2006 and 2009 seasons were outliers, with lower three-point, free-throw percentages, and assists in wins than losses. In 2006, this was attributed to significant injuries to key players like Larry Hughes, meaning James could only win when teammates performed well or he played exceptionally. In 2009, despite achieving 60 wins and an MVP, his performance in losses was unexpectedly better, explained by the absence of Shaquille O'Neal in those games. Due to the mismatch between O'Neal and James, both needing space in the paint, James had to opt for long-range shots and more passing when O'Neal was playing. Overall, during this period, James's exceptional offensive performance was crucial for team victories, and his defensive efforts in wins were expectedly better than in losses.

In his second phase with the Miami Heat, his performance metrics in wins were generally lower than in losses during the first year, an exception being three-point shooting and free throws. This indicates that with support from Wade and Bosh, James could afford to distribute the offensive load, resulting in efficient scoring opportunities for himself. However, across these four years, his offensive performance was generally better in wins, albeit with fewer drives to the basket, favoring mid and long-range attempts. His defensive performance also tended to be better in wins, except in 2013, likely due to a small sample size of losses.

In his third phase, returning to the Cavaliers with All-Star teammates like Irving and Love, and with the league's shift towards three-point shooting, James's three-point shooting and free throws in wins were generally lower than in losses. This suggests he could afford to attempt more three-pointers in wins, reducing drives to the basket, but had to rely on driving more in losses. On defense, by 2017, there's a clear trend of his defensive effort dropping in wins, supporting the hypothesis that James was conserving energy for offense by reducing his defensive workload.

**3.2 How is the visualization truthful, functional, beautiful, insightful, and/or enlightening?**

Truthfulness: My visualization ensures the authenticity of the presented results by directly extracting numerical values from the dataset. Using the read\_csv function to load data guarantees the originality and accuracy of the data. By accurately mapping data points onto the chart, I ensured the visualization precisely reflects LeBron James' performance across different seasons.

Functionality: My visualization design focuses on showcasing LeBron James' offensive and defensive performance, as well as his scoring situation each season. Utilizing geometric objects like geom\_line, geom\_point, and geom\_rect from the ggplot2 package allows me to clearly display the data's trends and distribution. Moreover, selectInput and sliderInput controls enable users to interactively select variables and seasons to view, enhancing the functionality of the visualization.

Aesthetics: I applied predefined themes through shinytheme and customized the appearance of the chart using functions like theme\_minimal() and scale\_fill\_manual, making the visualization not only informative but also visually appealing. The choice of colors reflects the colors of LeBron's teams, further enhancing the chart's appeal and readability.

Insightfulness: My visualization reveals how LeBron James' performance varies with time and team changes, providing deep insights into the progression of his career. By calculating the average score for each period and displaying it with dashed lines, I highlighted the differences in his performance during different team periods, thus offering valuable insights for evaluating his career.

Enlightenment: By showcasing LeBron's offensive and defensive performance in closely scored games, my visualization inspires deeper discussions and analysis of basketball player performances. This is not only appealing to basketball fans but also provides sports analysts with a unique perspective for exploring individual player impacts on game outcomes.

Through carefully designed visualization techniques, I ensured that the presented data is both truthful and attractive, while also providing functional, insightful, and enlightening analysis to meet the needs of various audiences.