NBA in Charts: Interactive Performance Review

Introduction:

The NBA, which stands for the National Basketball Association, is one of the most prominent and popular professional sports leagues in the world. Founded on June 6, 1946, in New York City, the NBA has grown to become a global phenomenon, capturing the hearts of millions of fans across continents. The league is widely recognized for its high-flying athleticism, fierce competition, and iconic players.

At its core, the NBA is a men's professional basketball league comprising 30 teams, divided into two conferences: the Eastern Conference and the Western Conference. Each conference is further divided into three divisions, making for a well-structured and competitive setup. The regular NBA season typically runs from October to April, with each team playing 82 games. The top eight teams from each conference advance to the playoffs, which take place in a best-of-seven series format. The playoff rounds eventually lead to the Eastern and Western Conference champions facing off in the NBA Finals to determine the league champion.

The NBA has produced some of the most legendary athletes in sports history, including Michael Jordan, LeBron James, Kobe Bryant, Magic Johnson, and many others. These players not only achieved immense success on the court but also played a significant role in elevating the league's popularity to unprecedented heights. As of 2020, NBA players are the world's best paid athletes by average annual salary per player. With its thrilling games, captivating storylines, and global appeal, the NBA continues to captivate audiences worldwide and remains an integral part of sports culture, connecting people from all walks of life through the love of basketball.

For over seven decades, the NBA has been the epicenter of basketball excellence, attracting millions of passionate fans and nurturing the talents of countless players. With such a rich and illustrious history, the league has accumulated an extensive trove of data, offering an unparalleled opportunity for in-depth analysis and exploration.

Ambitiousness of the Project:

In recent years, the NBA has harnessed the potential of sports analytics, integrating it seamlessly into its strategy and decision-making processes. Advancements in technology and data collection have allowed teams to rely on data-driven insights, optimizing game strategies, assessing player performances, and identifying emerging talents. The revolutionary impact of sports analytics has reshaped how the game is played, enabling coaches and analysts to explore players' statistics, shot charts, and overall, on-court impact in unprecedented detail.

This ambitious project, "**NBA in Charts: Interactive Performance Review**," takes inspiration from the transformative power of sports analytics. Its comprehensive scope aims to leverage cutting-edge tools and techniques, diving deep into vast NBA datasets to reveal compelling insights. Using data visualization in Tableau, the project aims to present intricate narratives, connecting player statistics to team dynamics and highlighting the influence of key players.

Target Audience: The visualizations and analyses in this project are designed to engage a wide range of audiences. Sports analysts, statisticians, and researchers will appreciate the in-depth exploration of NBA data, uncovering trends and patterns that can inform strategic decisions. By skillfully blending technical precision with accessibility, the visualizations bridge the gap between data and storytelling, igniting a passion for sports analytics and empowering stakeholders with actionable insights. Also, casual fans will find compelling and immersive narratives that bring the rich history of the NBA to life, enhancing their appreciation for the game. The project's accessibility ensures that anyone with an interest in basketball can gain valuable insights into the sport's evolution over the years.

Embracing the transformative power of sports analytics, this project aspires to make a lasting impact on basketball's appreciation as a sport and the significance of data-driven decision-making. By combining innovation, technology, and a profound passion for basketball, it stands as a testament to the boundless possibilities sports analytics holds for shaping the future of professional sports. As it unravels the NBA's rich history through data visualization, it celebrates the continuous evolution of the game and showcases the limitless potential that sports analytics offers to propel the league forward.

Research Questions:

1. What are the winning percentage trends of different NBA teams over the years, and which teams have consistently performed at the highest and lowest levels?
2. How do points, assists, and rebounds statistics for NBA teams vary over different seasons, and are there any teams that consistently excel in all three performance metrics?
3. How have the performances of top players influenced their respective teams' overall success and performance?
4. Is there any correlation between player height vs. weight, and their effectiveness in different positions?

5. How do the performances of NBA legends LeBron James and Stephen Curry compare over multiple seasons?

Methodology:

About the datasets:

The use of authentic and comprehensive data from official sources is vital as it forms the foundation of analysis, allowing to draw meaningful conclusions and make informed decisions.

For this project, real-world data from official NBA Stats' sources has been used to gain insights into the performance of players and teams over the last 15 seasons (2008-09 to 2022-23). The primary datasets employed include 'Players Per Game Stats' and 'Teams Per Game Stats,' which contain detailed statistics about individual player performance and team-level statistics per game, respectively.

Sources:

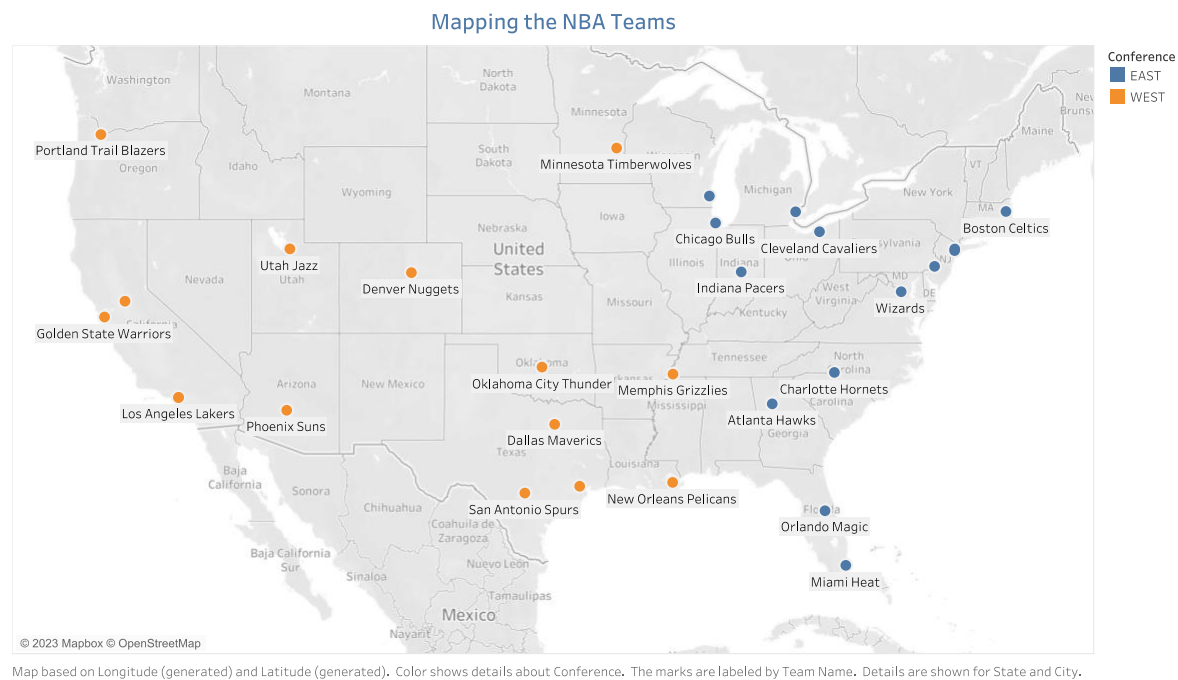| Name of the Dataset	File Name	Source	Links
Team Stats Per Game	Team_Stats_NBA_(2008-09_2022-23)_gg.xlsx	Web-Scraping	https://www.nba.com/stats/teams/traditional?SeasonType=Regular+Season&Season=2022-23
Player Stas Per Game	Players_STATS_BBREF_(2008-09_2022-23)_gg.xlsx	Web-Scraping	https://www.basketball-reference.com/leagues/NBA_2023_per_game.html
NBA Player Salaries	NBA-Salaries_1990-2023_gg.xlsx	Kaggle	https://www.kaggle.com/datasets/loganlauton/nba-players-and-team-data

Analysis:

Visualization 1: Mapping the NBA Teams

In this visualization, I have presented geographical representation of NBA teams on a map, allowing to visually understand their distribution across different locations. Each team is represented by a marker on the map, color-coded according to their respective conferences, providing an immediate overview of the league's regional presence.

The map effectively highlights the concentration of NBA teams from major cities, while also revealing the league's outreach to various regions across the United States & Canada. Additionally, it offers insights into the balance between the Eastern and Western conferences.

Overall, this map visualization provides an accessible and visually compelling introduction to the spatial aspects of the NBA, setting the stage for a deeper understanding of the league's dynamics and enabling us to address more sophisticated research questions in subsequent visualizations.


Map based on Longitude (generated) and Latitude (generated). Color shows details about Conference. The marks are labeled by Team Name. Details are shown for State and City.

Visualization 2: NBA Teams' Establishment Timeline

In this captivating visualization, we embark on a historical journey through the establishment timeline of NBA teams, tracing the origins of each franchise and their entry into the league over time. I have used a chronological line graph to present a clear and intuitive representation of when each NBA team was founded.

The horizontal axis of the line graph represents the timeline, spanning from the early years of the NBA in 1946 to the recent times. Each data point along the timeline corresponds to a specific NBA team's establishment year. The vertical axis indicates the count of teams established in each corresponding year.

The line graph visually showcases the growth and evolution of the NBA, illustrating key milestones of expansion and the birth of new franchises. As we follow the line graph from left to right, we observe the league's progression from its humble beginnings with a handful of teams to the vibrant array of franchises that exist today.

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NBA Teams' Establishment Timeline
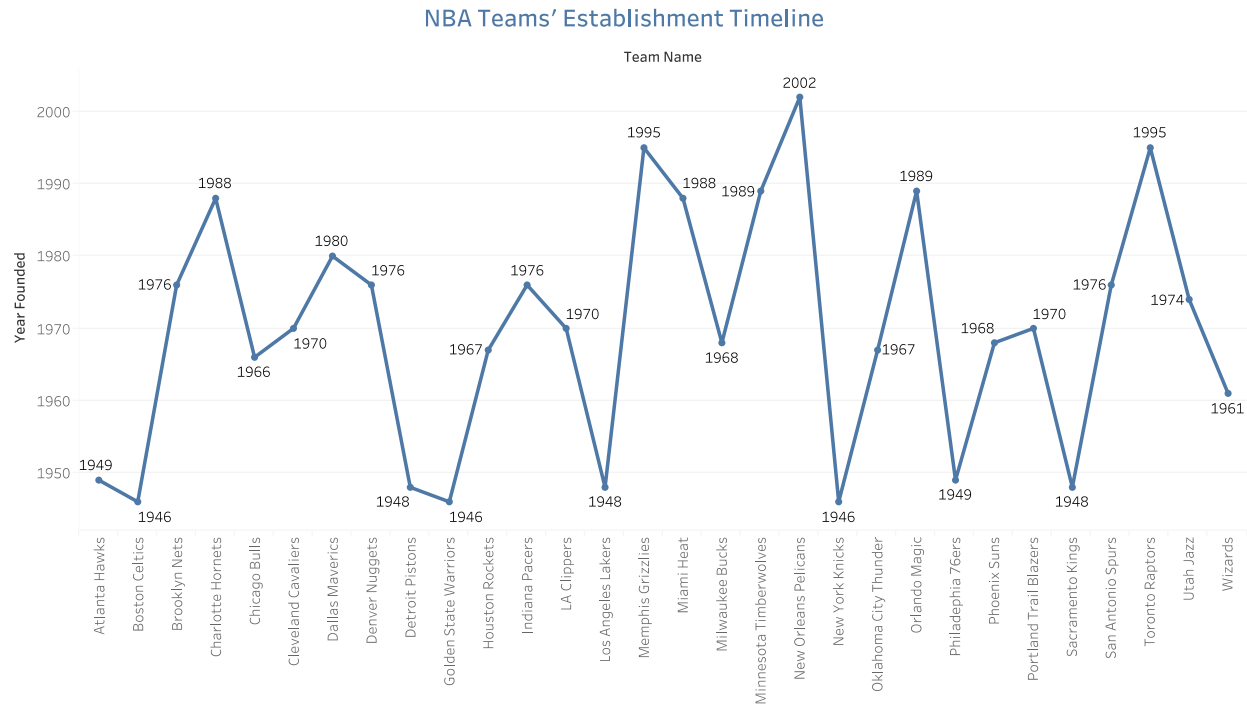
Team Name

The trend of Year Founded for Team Name.

Visualization 3: NBA Player Position Distribution

In this visualization, we can explore the distribution of NBA players across different playing positions, providing an insightful glimpse into the balanced representation of players within the league's talent pool. I have used a pie chart, a circular representation, to illustrate the proportion of players in each playing position category, revealing a nearly equal distribution of players across the five positions.

Each playing position is represented as a distinct segment of the pie chart, with the size of each segment corresponding to the percentage of players belonging to the respective position. As we can see, the chart showcases that approximately 20% of NBA players are classified under each playing position: Point Guard (PG), Shooting Guard (SG), Small Forward (SF), Power Forward (PF), and Center (C). The remarkable balance in player distribution across positions is intriguing, suggesting that NBA teams have focused on creating well-rounded rosters with a relatively even distribution of talent across various roles. This strategic approach reflects the importance of diverse skill sets within teams and highlights the adaptability of players to multiple positions.
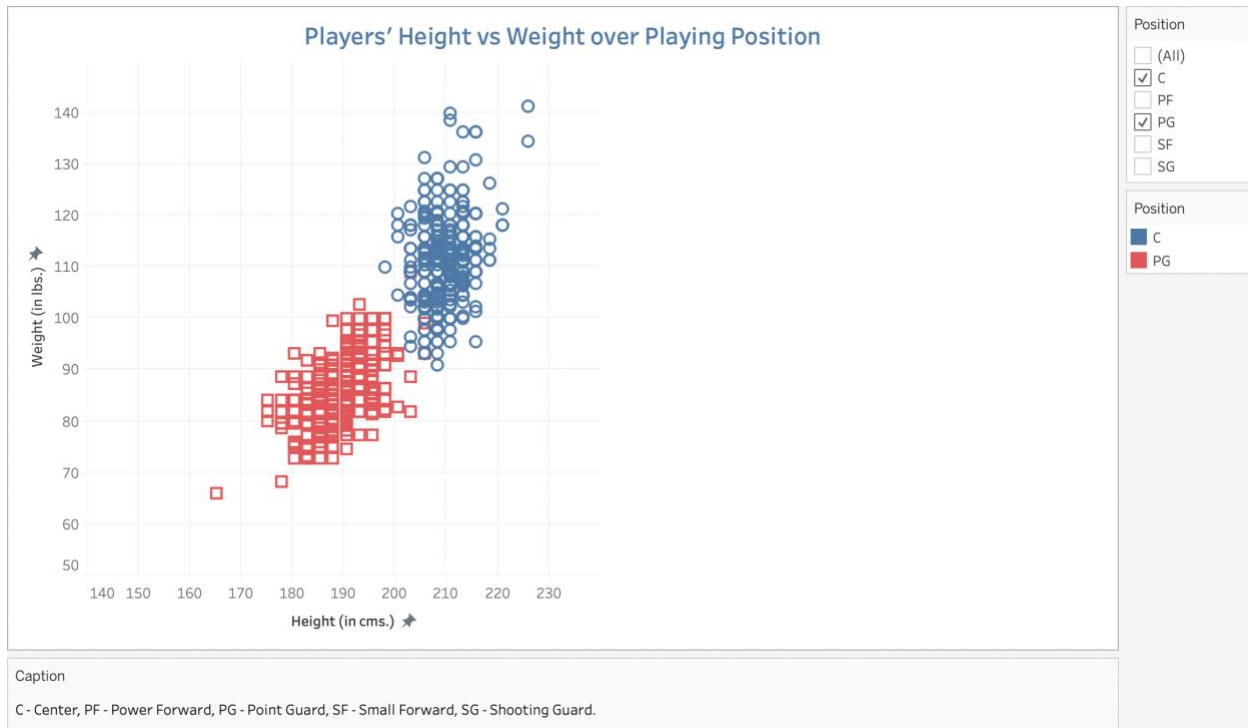
NBA Player Position Distribution
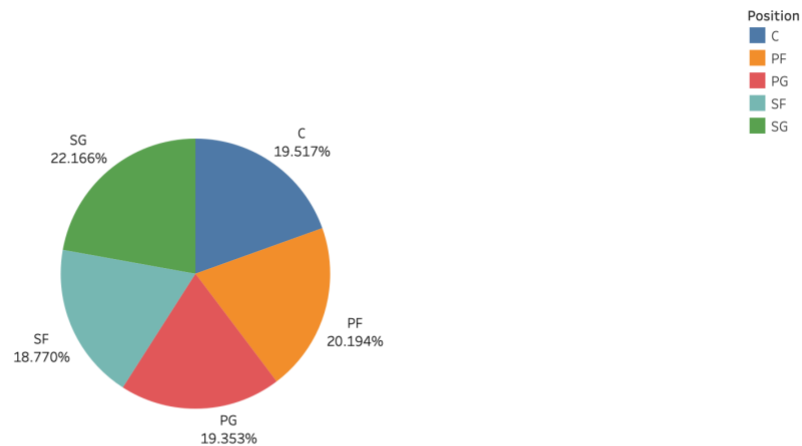
Position
- C
- PF
- PG
- SF
- SG

SG
22.166%

C
19.517%

PF
20.194%

SF
18.770%

PG
19.353%

C - Center, PF - Power Forward, PG - Point Guard, SF - Small Forward, SG - Shooting Guard.

Visualization 4: Players' Height vs. Weight Over Playing Position

In this insightful visualization, we explore the relationship between NBA players' height and weight across different playing positions. The chart utilizes a scatter plot, with each data point representing an individual player. The horizontal axis depicts the player's height in centimeters, while the vertical axis represents their weight in pounds.

By categorizing the data points based on playing positions, we gain valuable insights into the physical attributes of players in various roles within the league. Notably, we expect to observe a trend where Point Guards (SGs) are generally the shortest players, given their primary role as ball handlers and perimeter scorers. Conversely, Centers (C) are typically the tallest players, as they play a pivotal role in rebounding and interior defense.

Overall, this scatter plot visualization offers a compelling representation of the relationship between NBA players' height and weight based on their playing positions. It provides a visual narrative that supports the common understanding of the distinct physical attributes associated with different positions, while also paving the way for further investigations into the interplay between player characteristics and their performance on the basketball court.
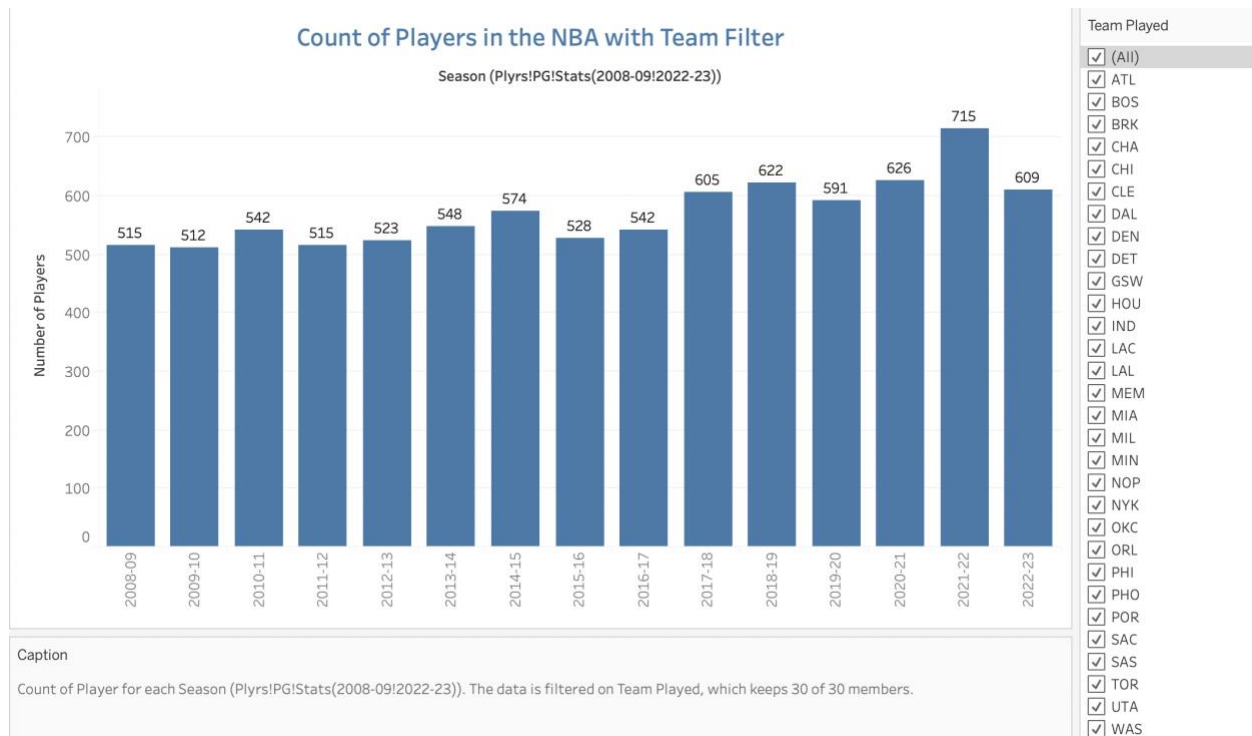
Players' Height vs Weight over Playing Position

Caption
C - Center, PF - Power Forward, PG - Point Guard, SF - Small Forward, SG - Shooting Guard.

Visualization 4: Count of Players in the NBA with Team Filter

This interactive and informative visualization presents a comprehensive overview of the count of players in the NBA, allowing us to explore player distribution across teams within the league. The chart employs a dynamic bar graph that showcases the number of players associated with each NBA team.

Using the dropdown team filter, we can select a specific team of interest, and the bar graph instantly updates to display the player count for the chosen team. This interactive feature enables a detailed examination of the roster size for any team, fostering a deeper understanding of the player composition within individual franchises.

Additionally, the dynamic nature of this visualization empowers viewers to explore how player counts have evolved over the last 15 seasons, as they can easily switch between different teams using the dropdown filter.

Count of Players in the NBA with Team Filter

Season (Plyrs!PG!Stats(2008-09!2022-23))

Team Played
- [✓] (All)
- [✓] ATL
- [✓] BOS
- [✓] BRK
- [✓] CHA
- [✓] CHI
- [✓] CLE
- [✓] DAL
- [✓] DEN
- [✓] DET
- [✓] GSW
- [✓] HOU
- [✓] IND
- [✓] LAC
- [✓] LAL
- [✓] MEM
- [✓] MIA
- [✓] MIL
- [✓] MIN
- [✓] NOP
- [✓] NYK
- [✓] OKC
- [✓] ORL
- [✓] PHI
- [✓] PHO
- [✓] POR
- [✓] SAC
- [✓] SAS
- [✓] TOR
- [✓] UTA
- [✓] WAS

Caption

Count of Player for each Season (Plyrs!PG!Stats(2008-09!2022-23)). The data is filtered on Team Played, which keeps 30 of 30 members.

Visualization 6: Distribution of Player Points in Relation to Team Points

This dynamic and insightful visualization delves into the relationship between individual player scoring and team performance, offering a comprehensive understanding of how player contributions impact overall team scoring. The chart employs a scatter plot with interactive filters to highlight specific data points based on average player points and team points.
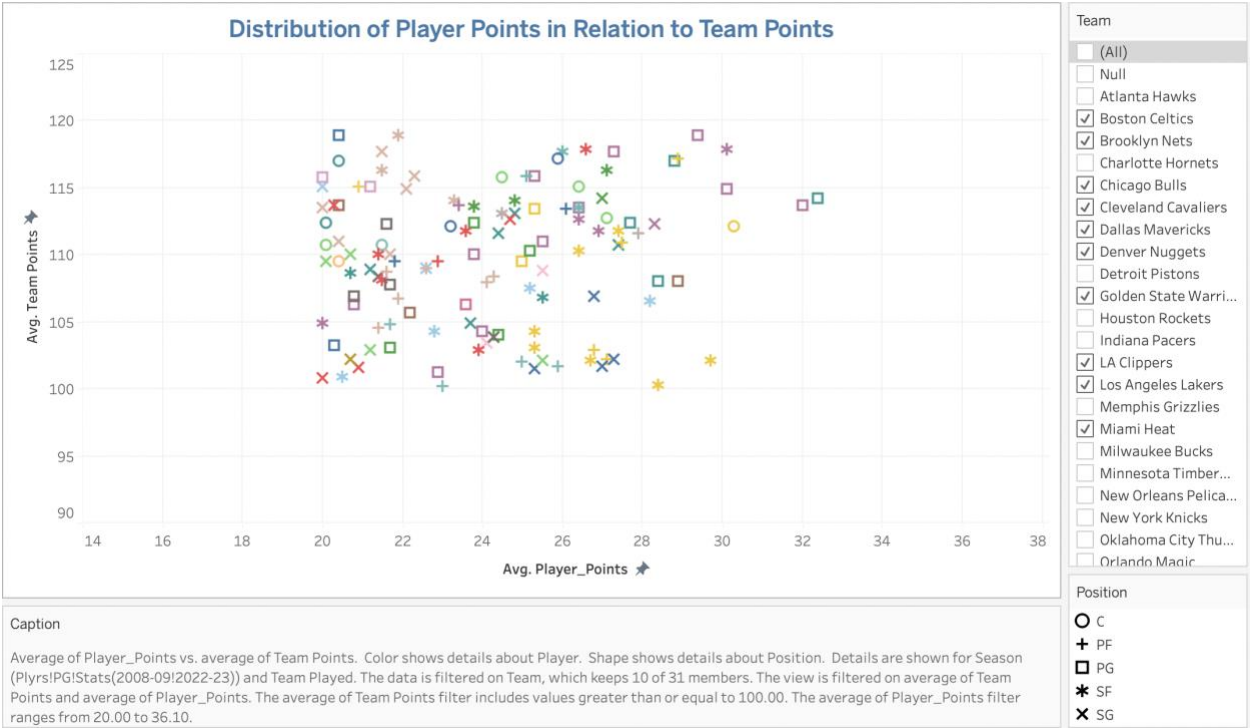
By setting an average player points filter of more than 20 and an average team points filter of 100, we focus on players and teams that exceed these thresholds, allowing us to concentrate on high-scoring players and high-scoring teams.

The visualization includes informative labels, providing essential details such as the team played, the position played, and the season for each data point. This feature enables viewers to identify individual players' performance in relation to their respective teams for any specific season.

Moreover, interactive filters for position played and team allow viewers to customize their exploration, refining the visualization to focus on specific positions or teams based on their preferences. This adaptability adds depth and value to the visualization, as viewers can dynamically assess how player points and team points relate to each other across different positions and teams.

In conclusion, the Distribution of Player Points in Relation to Team Points visualization provides a nuanced exploration of the intricate connection between player scoring and team performance. This visualization sets the stage for deeper investigations into the role of key players in driving team success and highlights the importance of balanced scoring strategies for NBA teams.


Distribution of Player Points in Relation to Team Points

Caption

Average of Player_Points vs. average of Team Points. Color shows details about Player. Shape shows details about Position. Details are shown for Season (Plyrs!PG!Stats(2008-09!2022-23)) and Team Played. The data is filtered on Team, which keeps 10 of 31 members. The view is filtered on average of Team Points and average of Player_Points. The average of Team Points filter includes values greater than or equal to 100.00. The average of Player_Points filter ranges from 20.00 to 36.10.

Visualization 7: Dynamic Players' Performance Comparison over Seasons

In this captivating and animated visualization, we embark on an enthralling journey through the dynamic performances of two NBA legends, LeBron James and Stephen Curry, over multiple seasons. The chart dynamically compares the individual player statistics of these iconic athletes, shedding light on their on-court prowess and evolution over the years.

Through a visually engaging and animated display, we can witness the statistical performances of LeBron James and Stephen Curry side by side, season by season. The chart is designed to dynamically update and transition between seasons, presenting a seamless and immersive experience of their respective contributions to their teams over time.

I have created a Calculated Field – "Players_Performance" which includes key performance metrics such as points, assists, rebounds, steals, free throws, field goals and turn overs to incorporate into the animated visualization, allowing viewers to observe how these superstars' skills and impact have evolved throughout their illustrious careers.

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Players_Performance = [Player_Points]+[Assists]+[Total Rebounds]+[Steals]+[Blocks]-((([Field Goal Attempts]-[Field Goals])+([Free Throw Attempts]-[Free Throw])+[Turn Overs])
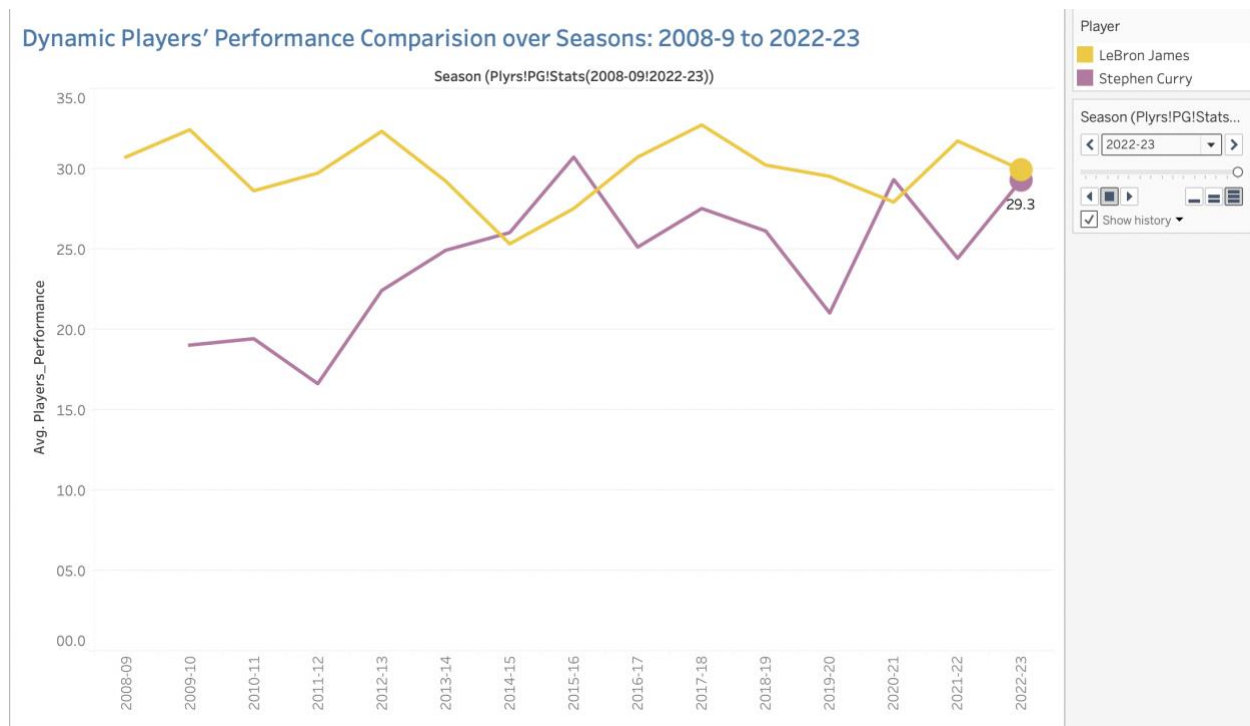
**Visualization 8:** Winning Percentage of Team over the Years

In this captivating and informative visualization, we explore the winning percentage of NBA teams over multiple seasons, gaining valuable insights into the competitive landscape of the league throughout the years. The chart utilizes a visually appealing and interactive treemap to showcase the winning percentages of all 30 NBA teams.

The treemap's hierarchical structure allows viewers to observe winning percentages at both the league level and individual team levels. Each square within the treemap represents an NBA team, with the size of the square proportional to the team's winning percentage. Color-coding within the treemap further aids in identifying teams with high and low winning percentages.

To provide additional context and summary statistics, a dynamic card on the side of the visualization displays the maximum and minimum winning percentages across all teams for the selected season. This feature enables viewers to identify the most successful and least successful teams during specific seasons, facilitating a deeper understanding of the league's competitive balance.

Furthermore, the interactive season filter empowers viewers to customize their exploration, allowing them to focus on specific seasons of interest. By selecting a particular season, viewers can observe how

winning percentages have fluctuated over time, potentially uncovering trends, dominant teams, or periods of competitive parity.
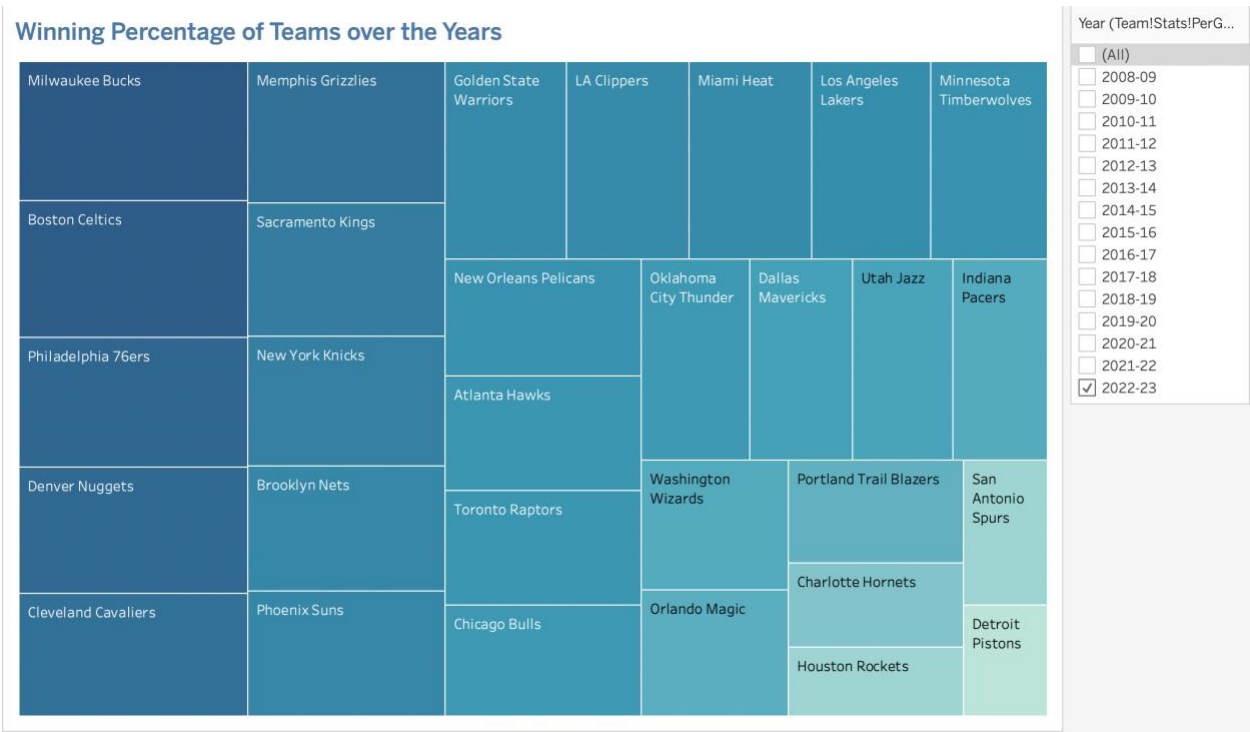
Visualization 9: Team Performance Trends: Points, Assists, and Rebounds

This compelling side-by-side bar chart visualization offers a comprehensive exploration of team performance trends in the NBA, focusing on three key metrics: points scored, assists, and rebounds. With each season as the x-axis, the chart dynamically showcases the performance of all NBA teams over the years.

The side-by-side bar chart format allows viewers to compare and contrast the points, assists, and rebounds of each team within a single view. Each bar corresponds to a specific team, and the height of the bars indicates the numerical value of the respective metric.

To enhance the depth of analysis, a team filter feature empowers viewers to select a particular team of interest, refining the visualization to display only the performance trends of the chosen team. This interactive capability enables a more focused examination of how a specific team's points, assists, and rebounds have evolved over the seasons.

The visualization offers valuable insights into team dynamics, offensive and defensive capabilities, and overall performance consistency over time. By observing how the bars change in height and position across different seasons, viewers can identify trends, improvement periods, and potential shifts in team

strategies. In conclusion, the Team Performance Trends: Points, Assists, and Rebounds visualization offers an engaging and interactive exploration of NBA teams' statistical performances over the years.
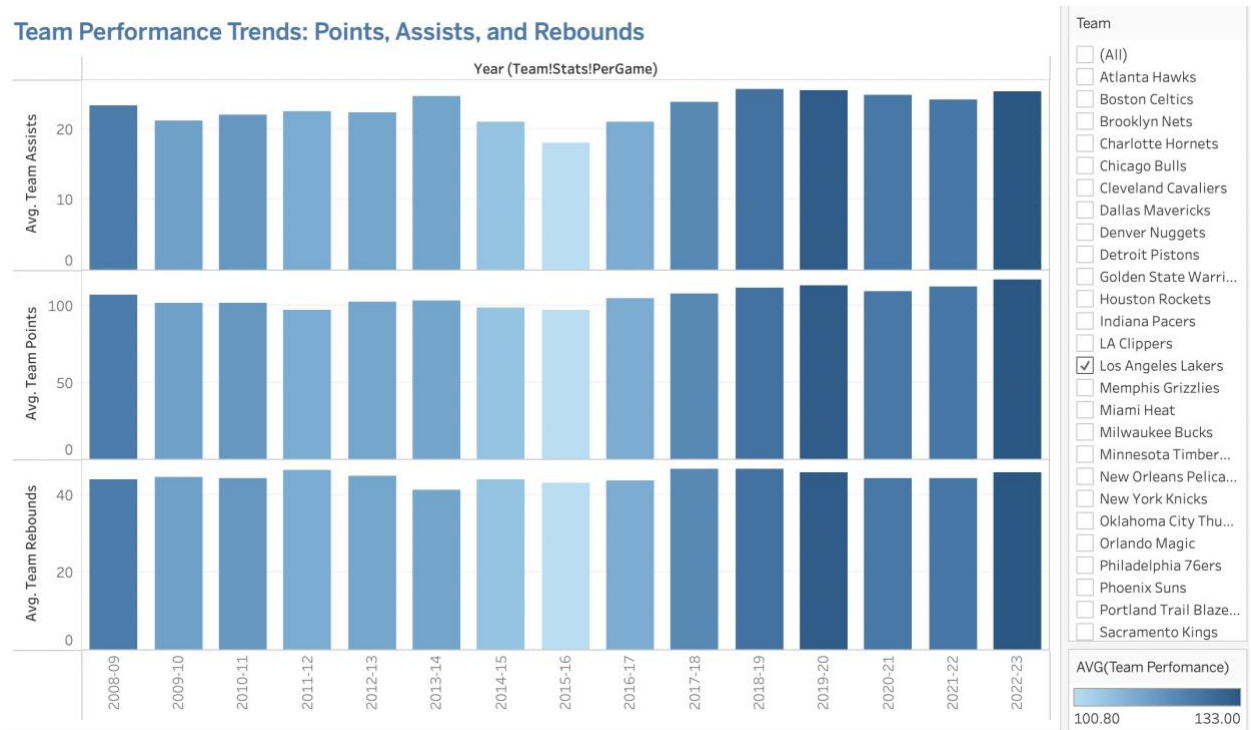
**Visualization 10:** Team vs. MVP Performance: A Comparative Analysis

This captivating and comprehensive visualization compares the performances of NBA teams with the outstanding contributions of their Most Valuable Players (MVPs) over multiple seasons. The chart features an interactive area graph depicting team performances and line graphs representing MVP performances inside the respective team areas.

To identify the MVPs, a filter has been applied to highlight players whose performance exceeds a threshold of >= 20. This filter allows viewers to focus on exceptional individual contributions that have earned players the prestigious MVP title.

The area graph displays team performances over the seasons, with each team's performance showcased as a distinct and color-coded area. Below is the calculated field used to display the Team Performance.

Team_Performance = [TeamPoints]+[Team Assists]+[TeamRebounds]+[STL]+[BLK]-((([FGA]-[FGM])+([FTA]-[FTM])+[TOV])

The interactive team filter allows viewers to focus on specific teams of interest, refining the visualization to display only the performances of the chosen team and their corresponding MVPs. This interactivity enables viewers to explore the impact of MVPs on their teams' overall performance and success.
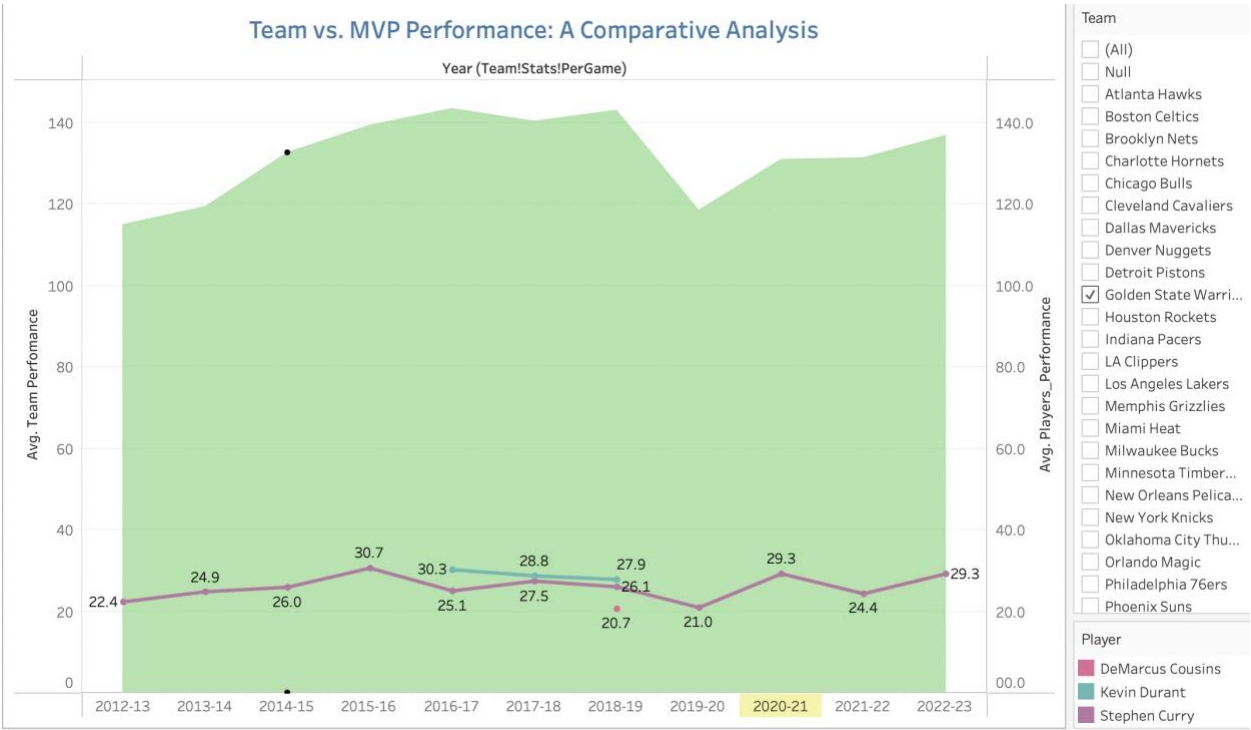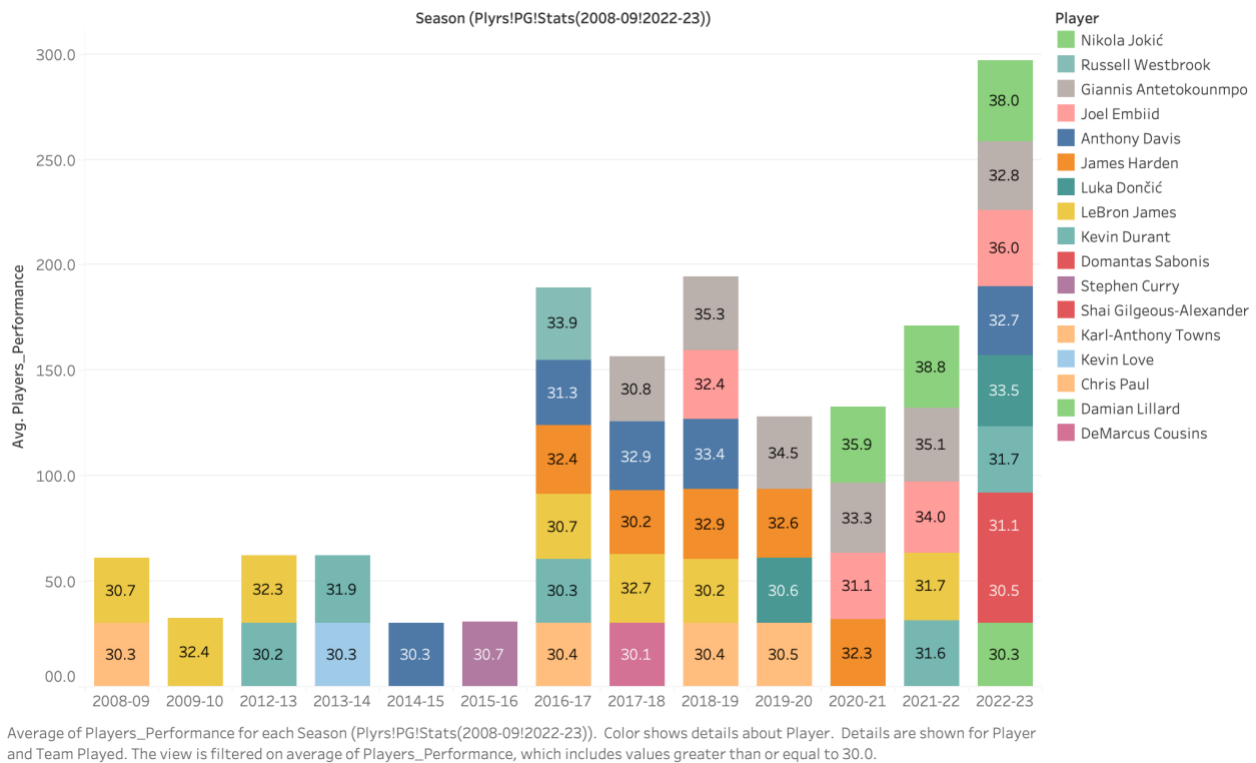

Visualization 11: Top Performers Over Time: Players and Their Team Diversity

This captivating visualization sheds light on the top performers in the NBA over the years, considering both individual player excellence and their team diversity. The stacked bar chart utilizes an innovative color-coded display to showcase players who have consistently demonstrated exceptional performances throughout multiple seasons.

The visualization's focus is the average performance of players (Players_Performance) for each season. Players who have showcased remarkable performances, with an average Players_Performance greater than or equal to 30.0, are highlighted in vivid colors, making it easy to identify these top performers. Each data point represents a specific player-season combination, and the color-coding provides essential details about the player and the team they played for during that particular season.

Accompanying details, such as the player's name and the team they played for during the season, are presented alongside the data points. This feature offers quick references to the top performers and their team affiliations, providing a comprehensive overview of the players' achievements and their diverse experiences with different teams over the years.

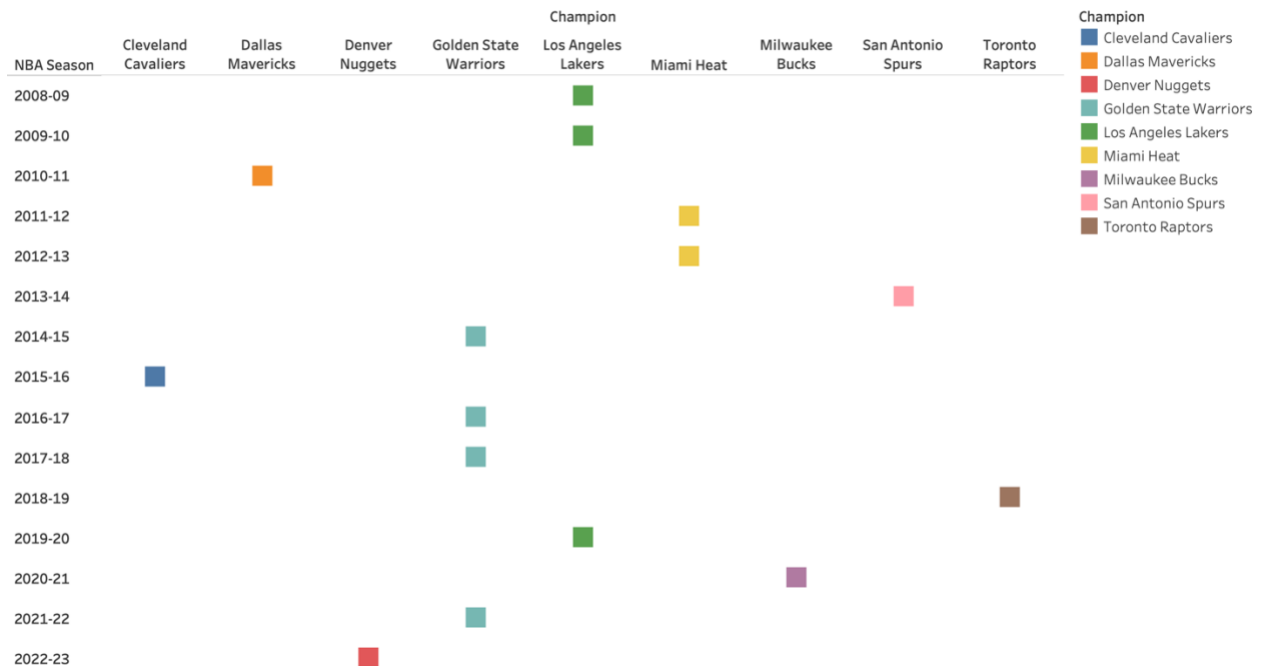## Top Performers Over Time: Players and Their Team Diversity

Season (Plyrs!PG!Stats(2008-09!2022-23))

Average of Players_Performance for each Season (Plyrs!PG!Stats(2008-09!2022-23)). Color shows details about Player. Details are shown for Player and Team Played. The view is filtered on average of Players_Performance, which includes values greater than or equal to 30.0.

Visualization 12: NBA Finalists: 2008-09 to 2022-23

This compelling visualization offers a historical exploration of NBA finalists, including both champions and opponents, throughout multiple seasons. The chart provides a comprehensive overview of the teams that have competed in the NBA Finals, the pinnacle of the league's annual championship playoffs.

The visualization dynamically displays the NBA finalists over the years, revealing the champions and their respective opponents for each season. Each data point corresponds to a specific season's NBA Finals matchup, with the names of the competing teams represented in an easy-to-read format.

By analyzing the chart, viewers gain valuable insights into the historical context and legacies of NBA Finals matchups. They can identify dynastic teams that consistently appeared in the Finals.

NBA Finalists: 2008-09 to 2022-23

NBA Season	Cleveland Cavaliers	Dallas Mavericks	Denver Nuggets	Golden State Warriors	Los Angeles Lakers	Miami Heat	Milwaukee Bucks	San Antonio Spurs	Toronto Raptors
2008-09					■ (Los Angeles Lakers)				
2009-10					■ (Los Angeles Lakers)				
2010-11		■ (Dallas Mavericks)							
2011-12						■ (Miami Heat)			
2012-13						■ (Miami Heat)			
2013-14								■ (San Antonio Spurs)	
2014-15				■ (Golden State Warriors)					
2015-16	■ (Cleveland Cavaliers)								
2016-17				■ (Golden State Warriors)					
2017-18				■ (Golden State Warriors)					
2018-19									■ (Toronto Raptors)
2019-20					■ (Los Angeles Lakers)				
2020-21							■ (Milwaukee Bucks)		
2021-22				■ (Golden State Warriors)					
2022-23			■ (Denver Nuggets)						

Champion (legend):
- Cleveland Cavaliers
- Dallas Mavericks
- Denver Nuggets
- Golden State Warriors
- Los Angeles Lakers
- Miami Heat
- Milwaukee Bucks
- San Antonio Spurs
- Toronto Raptors

Dashboard:

The interactive dashboard is a comprehensive and engaging exploration of the NBA's basketball landscape. It features a collection of dynamic and informative visualizations that cover a wide range of topics, from player performances, team performances and the impact of MVPs. The dashboard empowers viewers to analyze NBA data from multiple angles, providing a holistic view of the league's competitive dynamics and the brilliance of its players over time.

It offers a well-rounded exploration of various aspects of NBA basketball. With interactive features like season filters, viewers can delve deep into the data, uncovering historical trends, key matchups, and the stories that define the league's storied history. Whether it's comparing player performances, tracking team success over the years, or understanding the influence of MVPs on team dynamics, this dashboard provides an engaging and insightful experience for NBA enthusiasts and analysts alike.
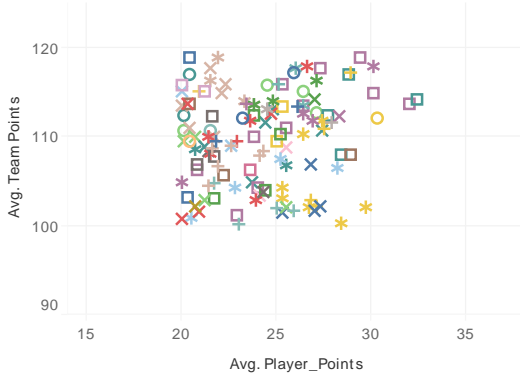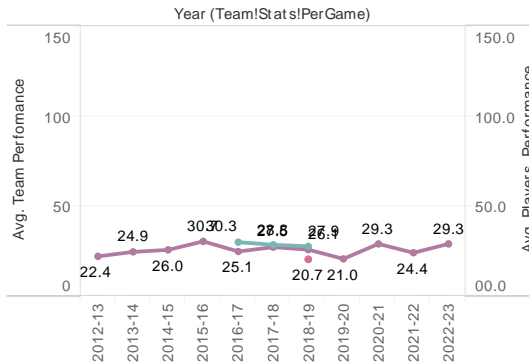
Winning Percentage of Teams over the Years
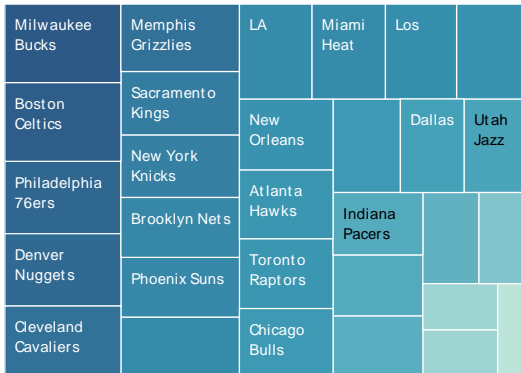
Team Performance Trends: Points, Assists, and Rebounds
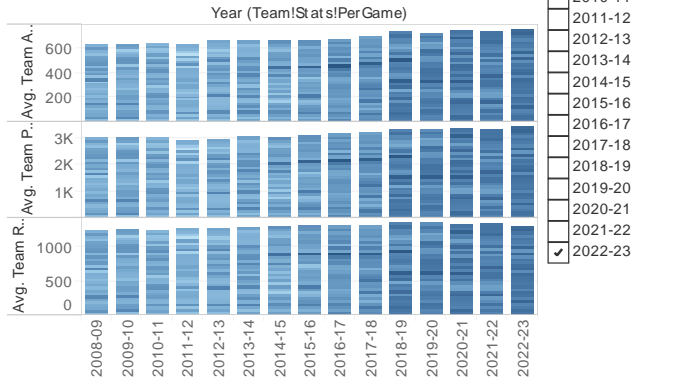
Distribution of Player Points in Relation to Team Points

Team vs. MVP Performance: A Comparative Analysis

Conclusions and Justifications:

1. What are the winning percentage trends of different NBA teams over the years, and which teams have consistently performed at the highest and lowest levels?

   The analysis of the "Winning Percentage of Teams over the Years" visualization indicates that there is no significant overall trend in the winning percentages of NBA teams. The top 5 teams each season have been different, showcasing the competitive nature of the league and the potential for any team to rise to the top each year. However, certain teams have demonstrated exceptional performance over specific periods. For instance, the Golden State Warriors remained dominant during the 4-year span from 2014-15 to 2017-18, showcasing consistency in their winning percentages. Additionally, the San Antonio Spurs have shown remarkable stability, consistently ranking among the top 10 teams for most of the last 15 seasons. These findings highlight both the dynamic nature of the NBA and the resilience of certain teams that have managed to maintain a competitive edge over time.

2. How do points, assists, and rebounds statistics for NBA teams vary over different seasons, and are there any teams that consistently excel in all three performance metrics?

The "Team Performance Trends: Points, Assists, and Rebounds" visualization reveals varied performance trends for NBA teams in points, assists, and rebounds over different seasons and as we can see, the density of the bars is going intense from the last 4-5 seasons, which indicates that the competition is on the upstream. Als, notably, teams like the Golden State Warriors have demonstrated consistent excellence across all three metrics, indicating a well-rounded gameplay and sustained competitiveness. Additionally, the Miami Heat, Phoenix Suns, Dallas Mavericks, Sacramento Kings, and Los Angeles Lakers have shown remarkable growth in points and assists in the latest season (2022-23), positioning them as strong contenders. This highlights the dynamic nature of team performance in the NBA, with some teams consistently dominating and others evolving to become competitive forces. The visualization enables us to identify teams with long-standing excellence and those experiencing recent surges, providing valuable insights into the league's evolving landscape.

3. How have the performances of top players influenced their respective teams' overall success and performance?

The "Team vs. MVP Performances in Respective Teams" visualization reveals a strong correlation between top players' performances and their respective teams' overall success in the NBA. Players like LeBron James, James Harden, and Kevin Durant have consistently showcased exceptional performances over the seasons, directly contributing to their teams' increased winning percentages and championship contention. Their prowess and impact on the court have been instrumental in elevating their teams to competitive levels, with their scoring accounting for a notable 30-35% of the team's average 100 points. Conversely, teams lacking such star players face challenges in achieving high winning percentages, as seen with Detroit Pistons and Washington Wizards. The visualization highlights the significance of individual brilliance and leadership in shaping team dynamics and underscores the pivotal role played by top players in influencing their teams' overall performance and success.

4. Is there any correlation between player height vs. weight, and their effectiveness in different positions?

The scatter plot visualization examining NBA players' height and weight in relation to their playing positions provides compelling evidence of a correlation between player physical attributes and their effectiveness in different roles. As expected, Point Guards (SGs) are generally the shortest players, emphasizing their role as agile ball handlers and perimeter scorers. Conversely, Centers (C) stand out as the tallest players, aligning with their significance in rebounding and interior defense. The visualization's clear categorization based on positions reinforces the widely accepted understanding of the distinctive physical requirements for each role in the league. By employing a scatter plot and organizing data points according to playing positions, the visualization enables

an intuitive exploration of the correlation between player height, weight, and positions. The observed trend, where SGs tend to be shorter and Centers taller, aligns with the traditional roles of these positions in basketball. The visual narrative effectively supports existing knowledge about the physical attributes associated with different roles on the court. Additionally, this visualization serves as a valuable foundation for future investigations, inspiring further research into the intricate relationship between player characteristics and their performance in various positions within the NBA.

5. How do the performances of NBA legends LeBron James and Stephen Curry compare over multiple seasons?

The dynamic comparison of NBA legends LeBron James and Stephen Curry's performances over multiple seasons reveals distinct trends in their average points per season. LeBron James consistently leads with an average of 30 points per season, showcasing his remarkable scoring prowess throughout his career. On the other hand, Stephen Curry maintains an impressive average of around 25 points per season, demonstrating his consistent high-level performance as well. The visualization illustrates LeBron James' dominance as a consistent top performer, while also highlighting Curry's exceptional 2015-16 season, coinciding with the Golden State Warriors' championship victory.

Additional Research Questions:

1. Which teams and players have the best offensive and defensive efficiency in recent seasons?
2. What are the trends in three-point shooting over the last decade?
3. How do player statistics differ between regular-season and playoff games?
4. What is the correlation between Offensive Rebound Percentage (ORB%) and second-chance points?
5. Which players are the most efficient 3-point shooters in the league?
6. How has the frequency of 3-point attempts changed over the years in the NBA?
7. Are there any players who are equally proficient in both 2-point and 3-point shooting?