A brief recap of your data, goals, and tasks, focusing on those that most directly influence your design

Data:

The initial data I selected was the 2023-24 Denver Nuggets Regular Season Per Game Stats to identify which players are most and least valuable to the team and provide insights on potential restructuring. After my initial design and analysis, I expanded my selection to include the 2023-24 NBA Stats. This comprehensive data, sourced from Basketball Reference (https://www.basketball-reference.com/leagues/NBA_2024_per_game.html), already excludes players who did not play enough games to qualify for the rankings.

The primary reason for switching to the larger dataset was that I realized relying solely on players' statistical averages could lead to inaccurate perceptions. Therefore, I cleaned the new dataset to include each player's rank and percentile data for each statistical category, then filtered it to focus exclusively on Denver Nuggets players.

Key Attributes for my Visualizations:

- Player: Name of the player
- MP: Minutes played per game
- TRB: Total rebounds per game
- AST: Assists per game
- STL: Steals per game
- BLK: Blocks per game
- TOV: Turnovers per game
- PTS: Points per game
- TRB_Rank: Total rebounds per game Rank
- AST_Rank: Assists per game Rank
- STL_Rank: Steals per game Rank
- BLK_Rank: Blocks per game Rank
- TOV_Rank: Turnovers per game Rank
- PTS_Rank: Points per game Rank
- TRB_Percentile: Total rebounds per game Percentile
- AST_Percentile: Assists per game Percentile
- STL_Percentile: Steals per game Percentile
- BLK_Percentile: Blocks per game Percentile
- TOV_Percentile: Turnovers per game Percentile
- PTS_Percentile: Points per game Percentile

Goals:
1. Performance Analysis: Evaluate the performance of players and understand their impact on the team.
2. Player Comparison: Compare players and discover insights (identify trends and patterns) and make recommendation on how to improve the team.

Core Tasks (the knowledge that I want to build) I want to accomplish with my visualizations:

- Which players had the most and least impact on the team's success?
- What players might we want to replace to improve the team next season?
- What are the strengths and weaknesses of each player?

Existing relevant visualizations:

- Bar Charts
  - Strengths: Clearly and easily compare statistical averages.
  - Improvements: Sorting (I sorted from Max-Min)
- Scatter Charts
  - Strengths: Great for showing correlation and distributions between metrics.
  - Improvements: Use color and a key to identify players and essentially add a third variable.
- Heat Map
  - Strengths: Easily compare all relevant Denver nuggets players at once
  - Improvements: Maybe remove certain people who don't play as much
- Spider Charts
  - Strengths: Clearly and easily see a players Strengths and weakness's
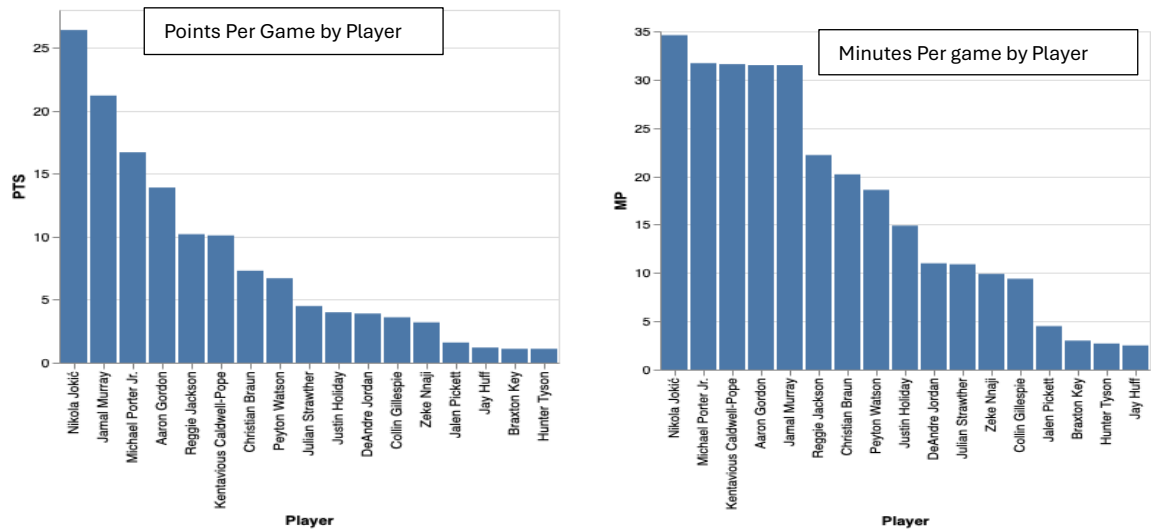 - Improvements: Make interactive to compare multiple players at once.

Summary of key points that most directly influenced my design

- Using bar charts, I compared statistical averages for points, assists, rebounds, and other key metrics. Sorting these from Max to Min allowing to identify the top performers.
- Scatter charts provided correlations between different key attributes, such as points per game versus minutes per game, highlighting players who excelled in both areas.
- Heat maps provided an overview of all players, making it easy to spot outliers and underperformers.
- Spider charts showcased each player's strengths and weaknesses, aiding player utilization and potential replacements.

These visualizations will provide the Coach and team with actionable insights, pinpointing the most impactful players and identifying areas for potential improvement. This analysis ensures that the team's performance is optimized for the upcoming seasons.
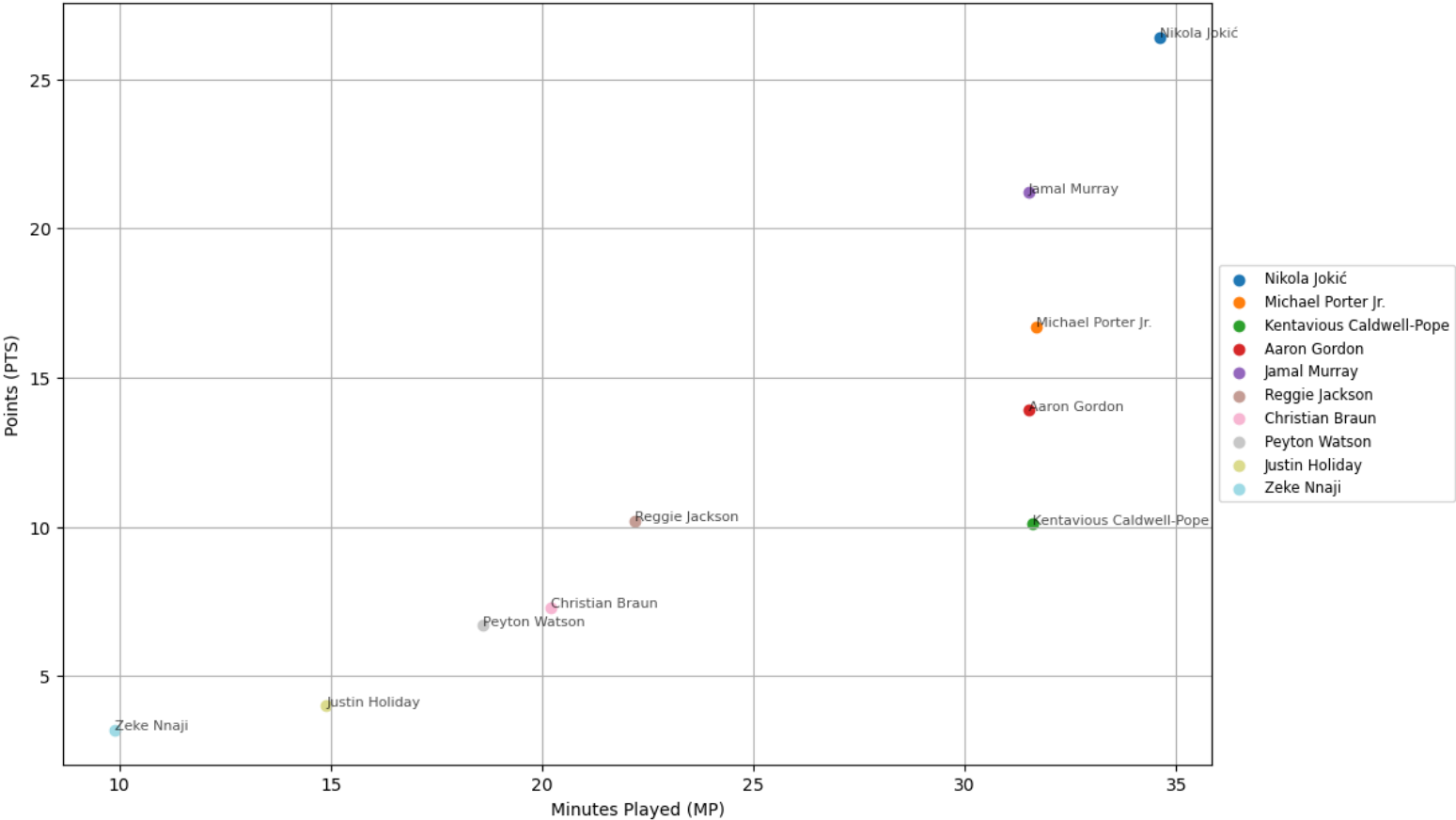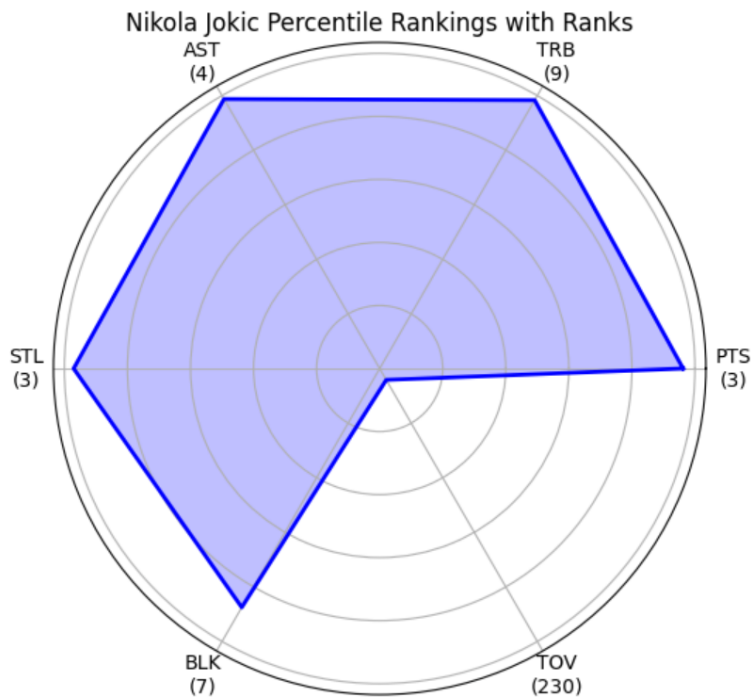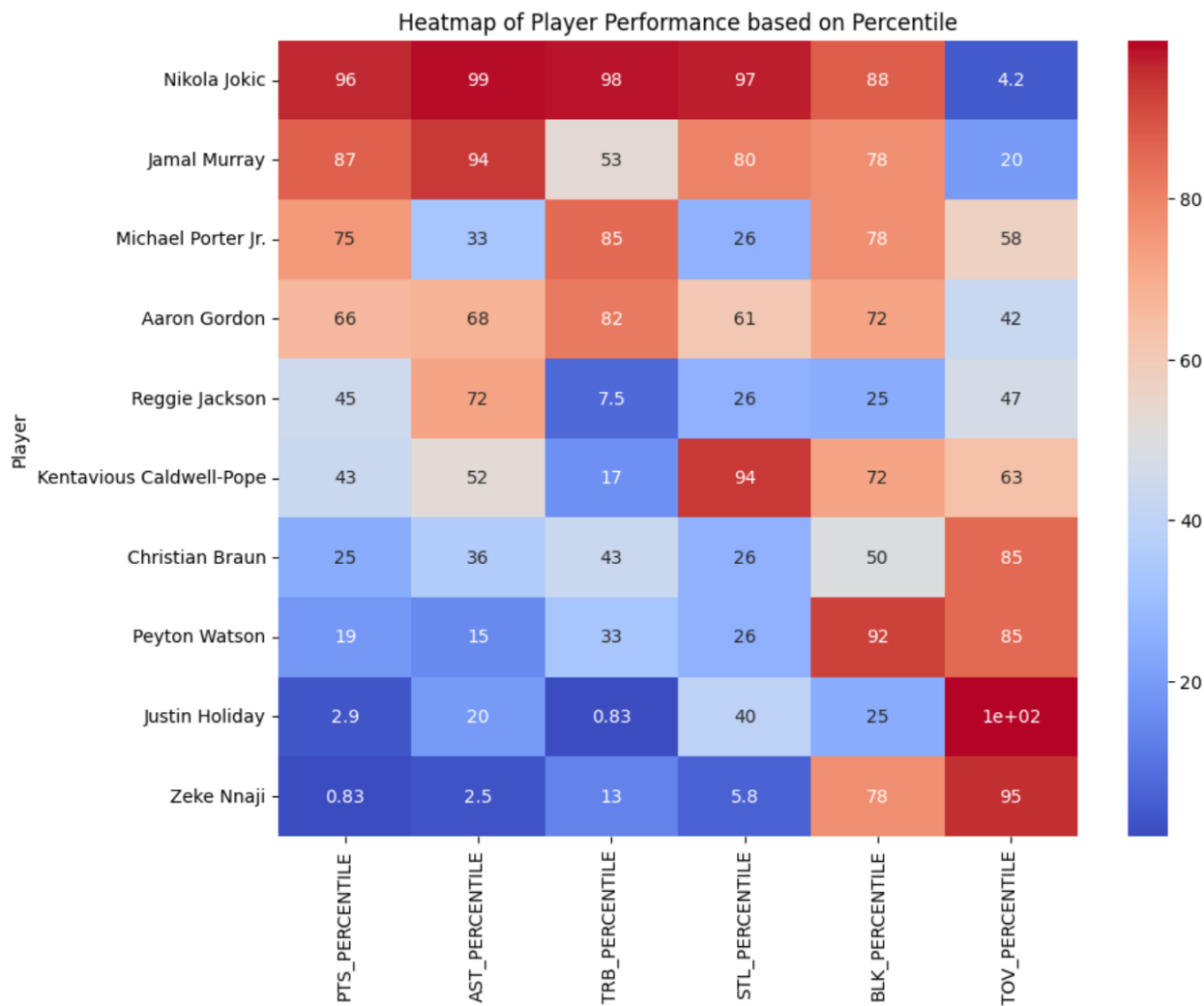
Visualizations:

Bar Charts:

Points Per Game by Player

Minutes Per game by Player

Scatter Plot:

Points vs Minutes Played for Denver Nuggets Players (2023-24 Season)

Spider Chart:

Nikola Jokic Percentile Rankings with Ranks

Heat Map:

Heatmap of Player Performance based on Percentile

Player	PTS_PERCENTILE	AST_PERCENTILE	TRB_PERCENTILE	STL_PERCENTILE	BLK_PERCENTILE	TOV_PERCENTILE
Nikola Jokic	96	99	98	97	88	4.2
Jamal Murray	87	94	53	80	78	20
Michael Porter Jr.	75	33	85	26	78	58
Aaron Gordon	66	68	82	61	72	42
Reggie Jackson	45	72	7.5	26	25	47
Kentavious Caldwell-Pope	43	52	17	94	72	63
Christian Braun	25	36	43	26	50	85
Peyton Watson	19	15	33	26	92	85
Justin Holiday	2.9	20	0.83	40	25	1e+02
Zeke Nnaji	0.83	2.5	13	5.8	78	95

A summary of the key elements of your design and accompanying justification

For the dimensions of the design space, I used the "5 W's" of WHY, WHAT, WHERE, WHO, and WHEN, as well as HOW. Specifically:

- WHY is a task pursued? This specifies the task's goal.
- HOW is a task carried out? This specifies the task's means.
- WHAT does a task seek? This specifies the data characteristics.
- WHERE in the data does a task operate? This specifies the target, as well as the cardinality of data entities within that target.
- WHEN is a task performed? This specifies the order of tasks.
- WHO is executing a task? This specifies the (type of) user.

Core Tasks:

1. Performance Analysis: Evaluate the performance of players and understand their impact on the team.
2. Player Comparison: Compare players discover insights (identify trends and patterns) and make a recommendation on how to improve the team.

Key Elements of my design and accompanying justification:

- Why is a task pursued? (goal). I used Exploratory analysis by deriving hypotheses from an unknown dataset. I will explore the data so that I can provide the Coach and team with valuable insights.
- How is a task conducted? (means). I used all three methods, Navigation, (Re-) Organizing, and Relation.
    - *Navigation*: I browsed and searched the data, to elaborate and summarize the data.
    - *(Re-)organization*: I adjusted the data to be shown by reducing it. The data reduction was done via filtering, and abstraction via generalization.
    - *Relation*: I sought similarities through comparison and seeking differences by looking for variations or discrepancies.
- What does a task seek to learn about the data? (characteristics). I used High-Level and Low-Level characteristics to compare specific values.
    - *Low-level data characteristics*: I made simple observations about the data, such as data values (using bar charts and scatter plots). Who scored more points? Who scored Fewer Points?
    - *High-level data characteristics*: Using heatmaps and radial charts I created more complex patterns by focusing on outliers, clusters, and frequency.

- Where does the task operate? (target data). The data is from ***2023-24 NBA Stats***. I used both the absolute and reference data frames.
  - Absolute Reference Frame Data: Numerical values tied to an individual player's performance without reference to other players or additional variables. Examples:
    - Games Started, Games Played, Position, Minutes Played, Pointes scored.
  - Relational Reference Frame Data: Compared players with each other. Examples:
    - Average number of points scored per game, Assists per game, Total rebounds per game.
- When is the task performed? (workflow). I will start with averages and then move to scatter plots, spider charts, and heat maps. Specifically, by looking into per game averages of Points, Assists, Steals, Total Rebounds, Blocks, and Turnovers.
  - Workflow Examples:
    - Exploratory Summarization of All Data. Overview of Key Stats for the Season:
      - Average points per game
      - Average Minutes per game
      - Averages of rebounds, assists, steals, and blocks
    - Exploratory Elaborate/Filter (Iterative Zoom and Filter)
      - Filter out non-qualifiers
      - Detailed visualization for the top player
    - Exploratory Look-Up on a Single Data Object
      - Detailed performance analysis of Team (Nuggets)
- Who is executing the task? (roles), I (Team/Sports analyst) provide the Coach and team with valuable insights. Specifically, I will provide the Coach and team with valuable insights derived from comprehensive data analysis of 2023-2024 NBA stats. I performed an initial exploratory summarization of key metrics such as the main statistical categories of Pts, assists, etc. By zooming in on specific aspects, such as the performance of top scorers and team standings, I iteratively filter and reorganize the data to highlight critical trends and standout performances. Additionally, I provided an in-depth analysis of our top players by examining key players per game stats. This iterative process ensures that the Coach and team are equipped with actionable intelligence to enhance their competitive edge. As an analyst, I translated data into performance improvements.

A discussion of your final evaluation approach, including the procedure, people recruited, and results. Note that, due to the difficulty of recruiting experts, you can use colleagues, friends, classmates, or family to evaluate your designs if experts or others from your target population are unavailable.

Final Evaluation Approach

I will discuss the approach by focusing on:

- Procedure/Results
- People Recruited: Mom, Aunt, Cousins

Procedure/Results **(I used the five design sheets method)**

Sheet 1: Brainstorming. I generated many ideas for visualizations without focusing on details. I eliminated the ones that did not provide much value.

- Bar charts for key player statistics (points, assists, rebounds) to identify top performers.
- Scatter plots comparing two performance metrics, such as points per game vs. minutes per game, to highlight correlations.
- Heat maps to provide an overview of all players' performance across various metrics.
- Spider charts to visualize individual players' strengths and weaknesses across multiple categories.
- Interactive visualizations.

Sheets 2, 3, 4: Iteration. I developed and refined several design ideas.

Sheet 2 (Iteration 1): I showed it to my mother and aunt, and I enhanced scatter plot readability by removing players that have no impact on the analysis and using color coding.

 I showed it to my mother and aunt, and I created Spider chart for each player, but then after seeing the data we decided to eliminate Interactive spider charts.

Sheet 3 (Iteration 2): I showed it to my mother and aunt, and I created Spider chart for each player, but then after seeing the data we decided to eliminate Interactive spider charts.

***Sheet 4 (Iteration 3)***: I showed it to my cousins, and I:

- Created an enhanced heat map from the 6 main statistical categories that are tracked in the NBA decision-making. For example, I removed the heat map based on the score as an absolute value and introduced the percentile since it is a standardization metric that allows to compare performance.
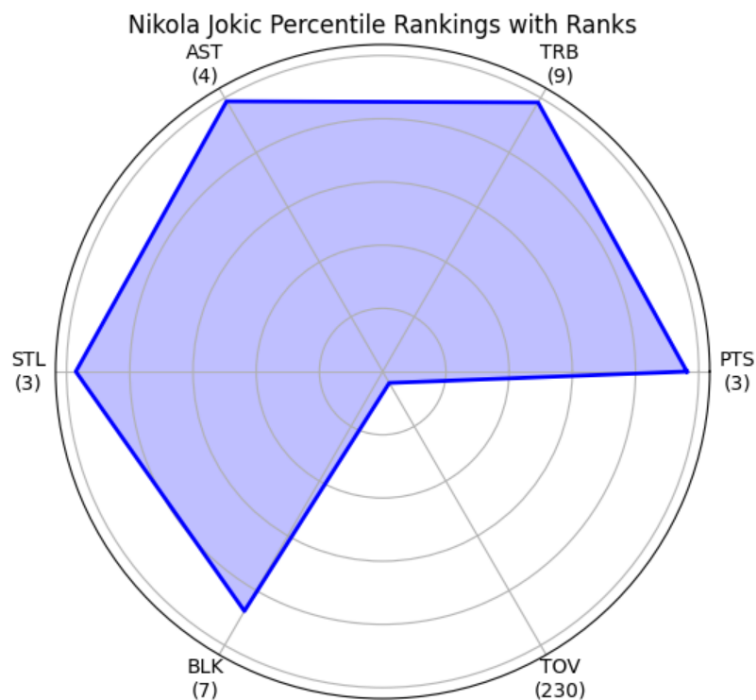
Sheet 5: Realization

Finalized the design by ensuring clarity, usability, and aesthetic appeal.

Final design is a Dashboard combining the best elements from previous designs.

- **Scatter Plot**: Points vs. MP

Points vs Minutes Played for Denver Nuggets Players (2023-24 Season)
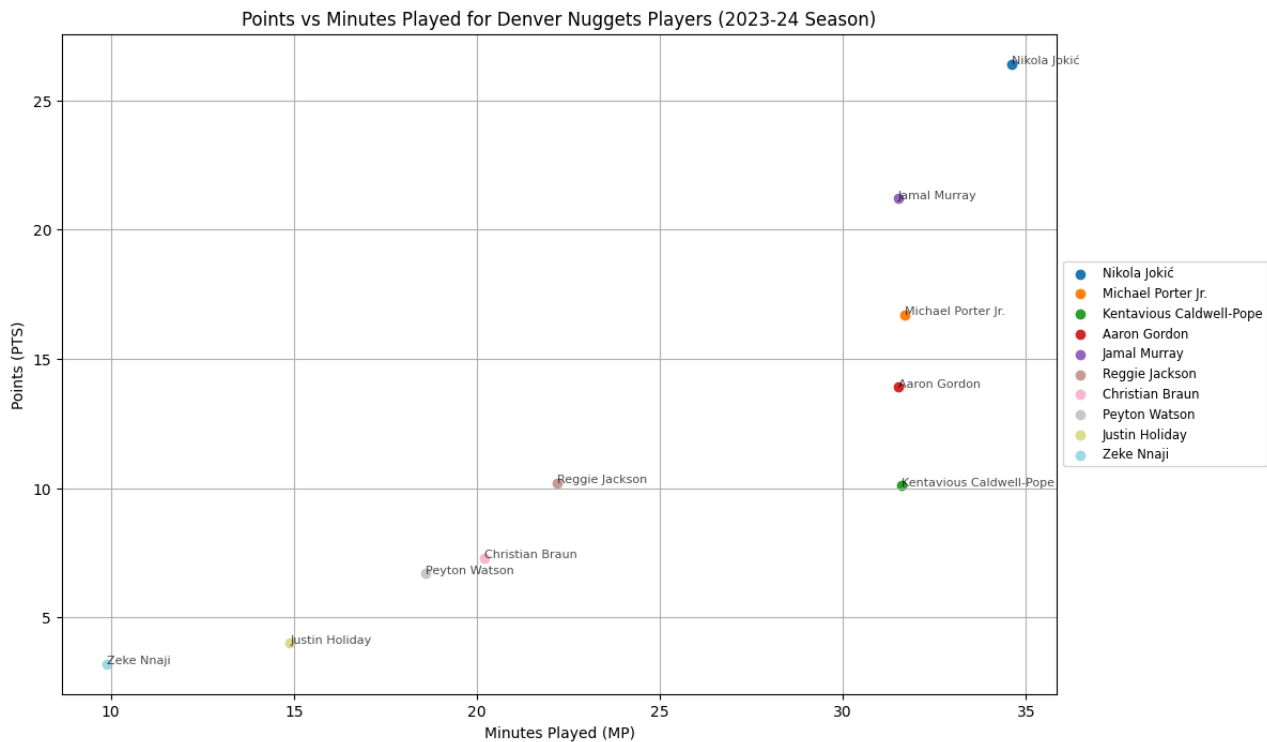
- **Spider Chart**: Strengths and weaknesses of selected players.

Nikola Jokic Percentile Rankings with Ranks

- **Heat Map**: Comparison of player stats with color scales.

Heatmap of Player Performance based on Percentile
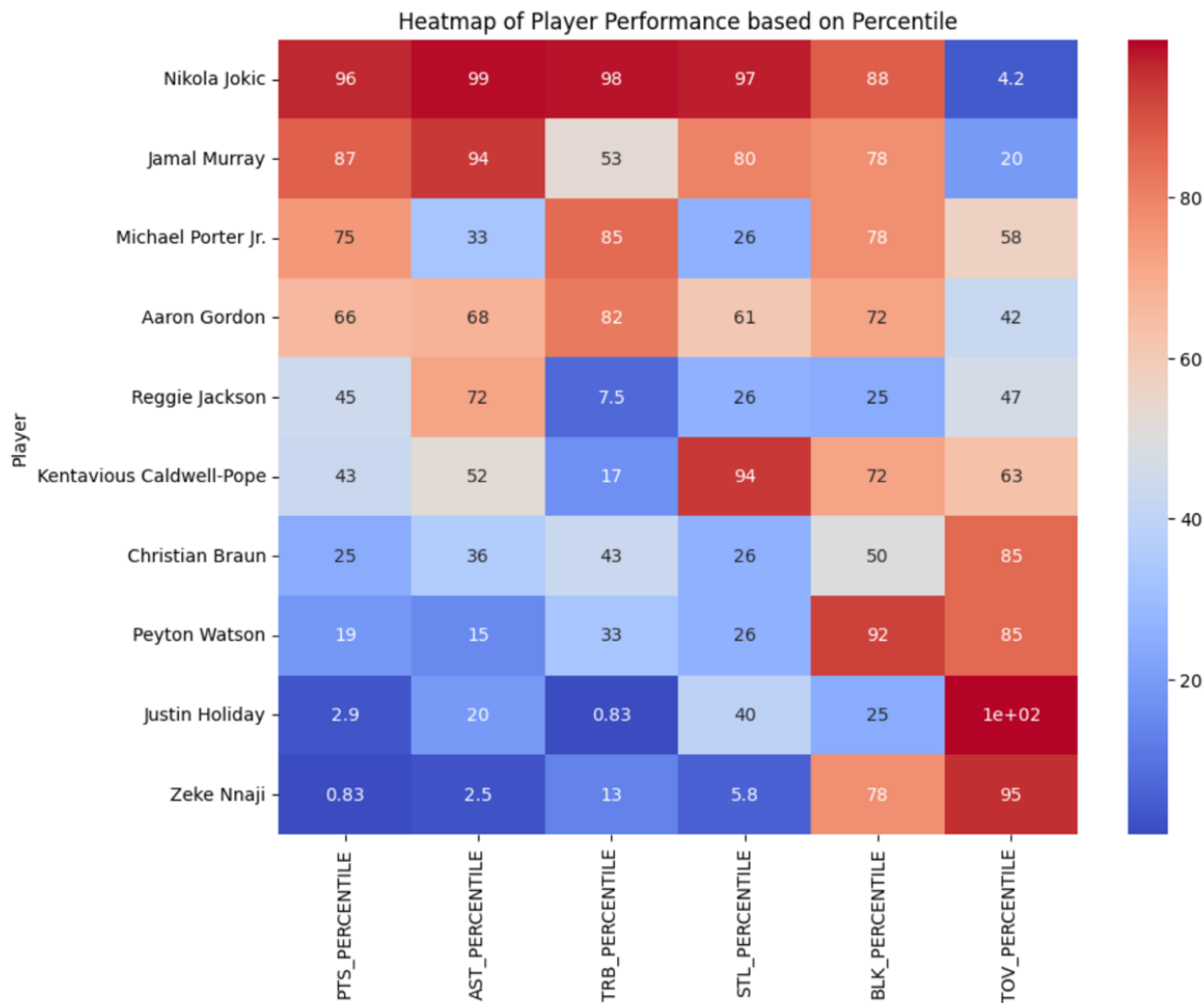
Synthesis Of my Findings:

The goal of this Dashboard and Visualizations was to provide the Coach and team with valuable insights derived from comprehensive data analysis of 2023-2024 NBA stats. I performed an initial exploratory summarization of a bar chart ranking all players from highest to lowest based on average points per game since that is the most important stat in basketball, but then I was curious how it would compare if we looked at minutes played per game.

This made me curious to see both in conjuncture with each other to see if this might make me come to a different conclusion, so I created a scatter plot that had Points per game on the y-axis, Minutes played per game on the x-axis, and each point is a different color which corresponds to the player in the legend. Looking at this scatter plot we notice a direct correlation in Minutes and Points per game, but the interesting insight we find is that Reggie Jackson who averages slightly more points per game then Kentavious Caldwell-Pope while averaging almost 10 minutes less per game.

Next, I wanted to see a player's full impact on the court by zooming in on the 6 most important stats in basketball. To consider all aspects of how a player may contribute, I decided to start by making a Spider Chart with Points (PTS), Assists (AST), Total Rebounds (TRB), Steals (STL), Blocks (BLK), and Turnovers (TOV). I initially was looking at all of Nikola Jokic's averages in the spider chart, but then realized that data was just relative, so I decided to clean the data and use percentile data to have a standard comparison for all players that season and then included his rank out of 240 players in Parenthesis for each category. This provided an easy way to look at one players Strengths and weaknesses, but it was hard to compare all the players with these charts without making it interactive.

Lastly after deciding the spider chart wasn't the most effective way to compare all the players at the same time based on the same categories, so I decided to make a heat map based on their percentile for each category. The heat map surfaced some interesting insights, as well as some expected insights as we would expect the three-time MVP Nikola Jokic, ranking 88th percentile or higher in 5 of 6 categories, is clearly our best player. What is interesting to see how bad he is at turnovers. After thinking about the Nuggets style of play though, Nikola Jokic and Jamaal Murray handle the ball the most out of everyone, so it makes sense for them to average more turnovers and players like Zeke Naji and Justin Holiday average less because they play less who play in comparison to everyone else. In addition, if we look at the NBA's scoring Leader Luka Doncic, we see that he also ranks 1st in turnovers, showing a similar correlation to Nikola Jokic.

If we revisit the interesting insight about Reggie Jackson and Kentavious Caldwell-Pope having nearly identical point averages while Jackson averaged 10 less minutes per game, we see some more insights around their overall play. With the heatmap we can see that Kentavious Caldwell-Pope ranks in the top 50% of the league on 4 categories, Reggie Jackson only does in one. Lastly one insight I did not expect is that based on the heatmap, Aaron Gordon is a more valuable

player to the team then Michael Porter Jr., but in the general perception of the public Michael Porter Jr. is a better player.

Elements that worked well:

I believe the heatmap worked very well in showing the impact of all the players at once. The spider chart was more visually intuitive to see a player's strengths and weakness compared to the league leaders and their team. Also the design framework and procedure went very smoothly.

Elements I would refine in the future:

There are a few things that I may want to include in future iterations. One thing that I wanted to include in the heat map is Minutes played per game, because if you don't consider my previous charts there could be some incorrect conclusions drawn, but at the same time the minutes data didn't work well with this heat map since we were using percentile. Additionally, I would also want to make the spider chart interactive so that you could overlay and compare 2 or more players at once with each other. Lastly, I would want to look deeper into some other stats in the future iterations like advanced metrics or maybe even things like Field goal percentage to see a player's efficiency beyond just statistical averages.