Project Milestone 2

Repo Link: https://github.com/sid-valecha/stat436-project

Shiny web app link: https://sid-valecha.shinyapps.io/project/

Choice of design prototypes

Our initial goal was to make a visual design that would be used to help the Milwaukee Bucks use data to improve their game strategy. When you first look at the visualization app, you can choose a Bucks player from the drop down. This will allow the team to first focus on a specific player to analyze their **Scoring Trends**, **Shooting Efficiency** and **Turnover Trends**.

- The **Scoring Trends** populates a line graph which shows how many points that player has scored. This will help identify players that are going through dry spells in their game or highlight players that are on a hot streak.
- The **Shooting Efficiency** graph shows a scatterplot of their FG% vs 3P%. With this plot, you can determine how well the player can shoot from long range and identify sharp shooters on the team.
- Lastly, the **Turnover Trends** graph is a bar chart that shows how many turnovers the player has per game. Here you can identify players who may not make the best choices with the basketball and can pick out who should play in higher pressure situations or not.

When you scroll down, you can compare the Bucks against any team in the league over the last few years. The Bucks management can choose their opponent of interest in the drop down which will populate some statistics for team comparisons.

- The **Offensive Rating Comparison** and **Defensive Rating Comparison** line graph shows the Bucks rating compared to the selected team. This will allow the team to see where they stand against the selected opponent. This could pinpoint what aspect of the game the team should focus on going into their game.
- The **League Average Comparison** graph shows the overall league comparisons in both ratings regardless of the team that is picked. This plot is useful to see where the Bucks stand

against everyone else at a glance. The blue and green lines are the Bucks and purple and orange are the league averages to see where they excel/underperform compared to the whole league.

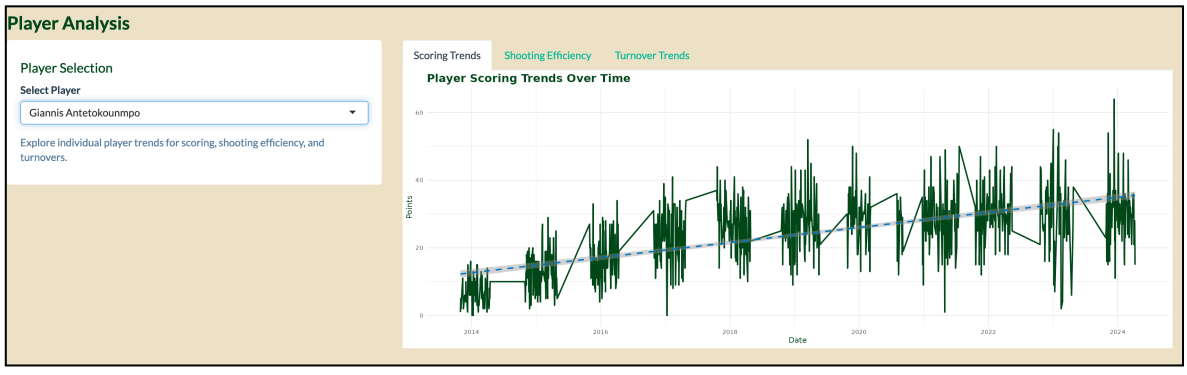
Demonstration and implementation discussion

Link to shiny app: https://sid-valecha.shinyapps.io/project/

We developed an interactive web app in R using Shiny, designed to visualize and analyze key metrics for Bucks players and the team. This app uses both static and interactive visualizations to allow for a flexible analysis of individual player statistics and team-wide comparisons within the NBA.

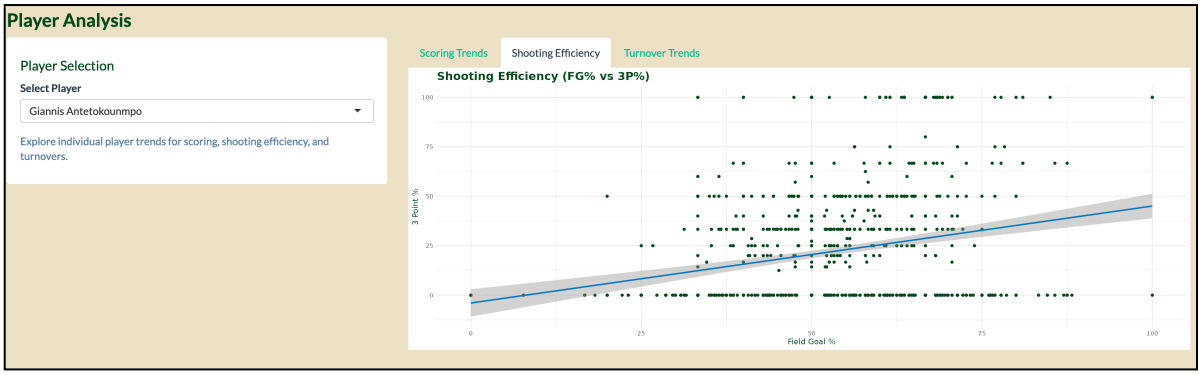
The first section of the app, "Player Analysis," enables users to select a Bucks player from a dropdown menu and explore three specific metrics, each displayed in a separate tab:

- **Scoring Trends**: This line plot visualizes a player's scoring progression over time. To highlight trends, we added a linear regression trend line. This aids analysts in identifying periods of high performance or slumps. The plot is rendered with **ggplot2** and `renderPlot`, ensuring quick, real-time updates based on the selected player.

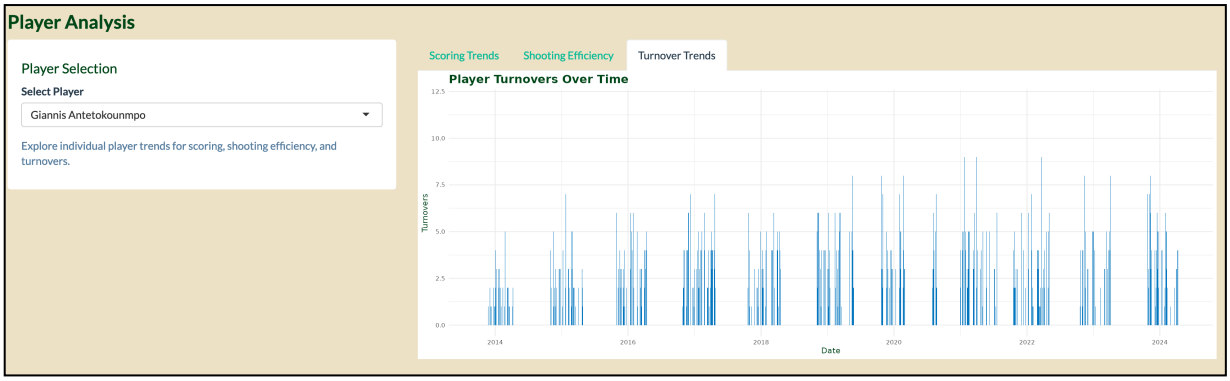


- **Shooting Efficiency**: To examine shooting accuracy, this tab features a scatter plot of Field Goal Percentage (FG%) versus Three-Point Percentage (3P%) for the selected player. A

linear trend line indicates shooting consistency, helping to identify proficient long-range shooters. This chart is also made with **ggplot2**.



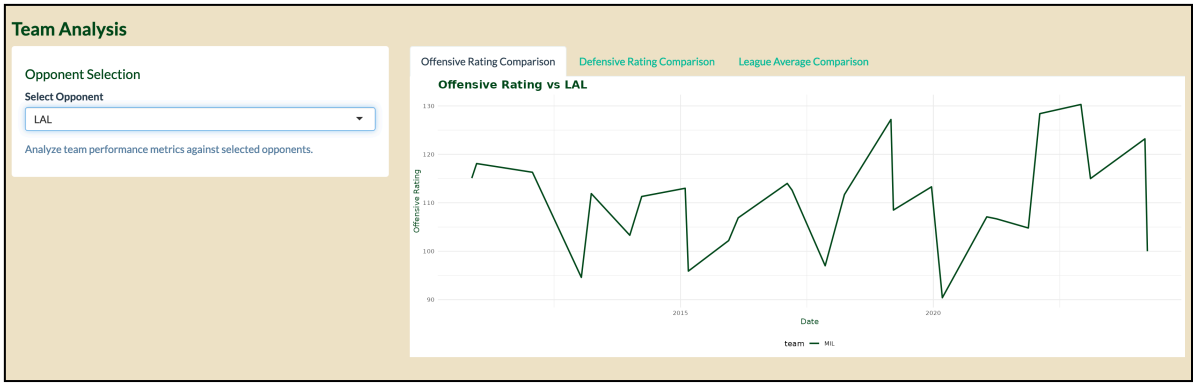
- **Turnover Trends**: The turnover trend is presented as a bar chart, displaying turnovers per game over time. This chart highlights players who might need to improve handling under pressure. This is implemented with `renderPlot`.

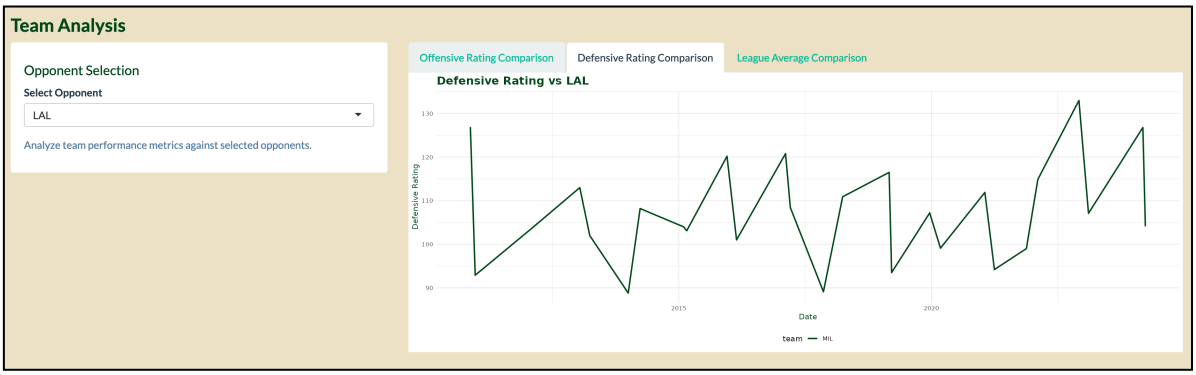


The second section, “Team Analysis,” allows users to compare Bucks' performance metrics against other teams. Users can select an opponent from the dropdown to update the visualizations:

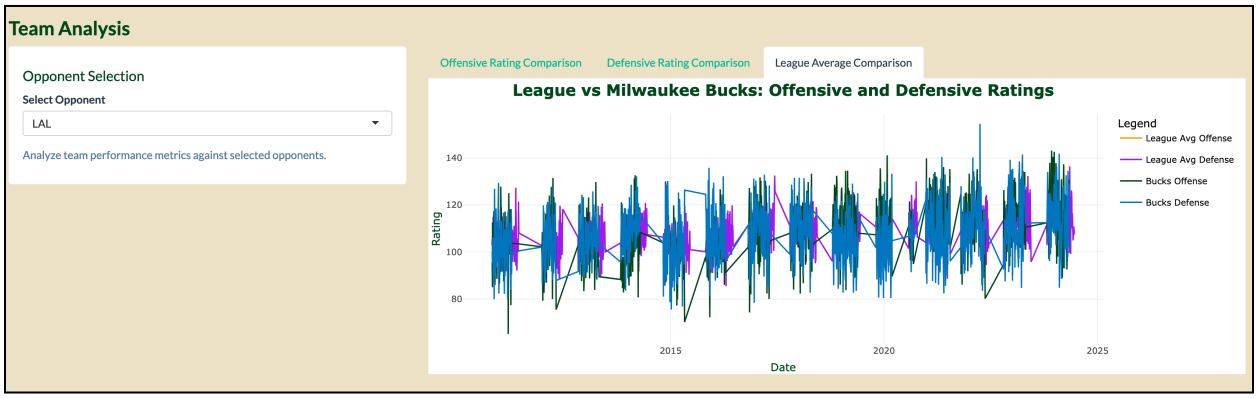
- **Offensive and Defensive Ratings vs. Opponents**: These line charts plot offensive and defensive ratings for the Bucks and the selected opponent. The opponent's data is displayed alongside the Bucks' data, using distinct colors to differentiate the teams. These visuals are

made with **ggplot2**, using **Shiny's** reactivity to update the plots when the opponent selection changes.





- **League Average Comparison**: This plot extends the analysis by comparing the Bucks' ratings with league-wide averages. It includes the offensive and defensive ratings of all teams, with the league average shown as distinct purple and orange lines, while the Bucks' metrics are displayed in team colors. Implemented with `plotlyOutput` and `ggplotly`, this interactive visualization allows users to zoom and pan across time periods, providing a high-level overview of the Bucks' relative standing in the league. (See link)



Implementation Logic:

Data preprocessing was essential for ensuring visualization accuracy and consistency. We filtered each dataset to focus on the 2010-2011 season onward to keep the analysis relevant to current trends. Missing values were managed with `drop_na()` to ensure data integrity across all visualizations. Player-level and team-level data from both traditional and advanced stats sources were merged, aligned by game ID, date, and team to enable comprehensive metric comparisons.

Within the Shiny app, `selectInput` dropdowns facilitate user interaction, allowing dynamic updates across both Player and Team Analysis sections based on user-selected inputs. The renderPlot function efficiently renders static plots, while `plotlyOutput` combined with `ggplotly` introduces interactivity to the League Average Comparison plot. This integration of Shiny's reactivity with **ggplot2** and **plotly** creates a responsive and user-friendly experience, enabling Bucks management to easily explore and analyze data insights. The interactivity in the League Average Comparison provides additional depth, as users can zoom into specific time frames or identify performance trends, which is valuable for strategic planning.

Critical Evaluation

There are a variety of potential trade-offs to consider to determine what is most important to our final product. Addressing shortcomings and potential concerns will build on what we believe to be a well-thought-out set of insights into the Milwaukee Bucks' individual player and team performance and other NBA teams' offensive and defensive strengths.

The main concern is the sheer amount of data and how that affects the relationship between information density and user misinterpretation. At this time, our application currently displays a considerable amount of statistical findings from our data, including offensive and defensive performance ratios on an individual player, team, and league scale. While including more data points allows for more in-depth data analysis, providing such a large amount of information could be too much for the audience to digest. This can cause them to be overwhelmed, miss critical findings that the data outlines, and deter them from using the application. To prevent this, we must prioritize a well-organized layout of our visualizations for the information to be more transparent and concise. Our use of tabular encoding is a valuable tool for allowing users to toggle between player, team, offensive, and defensive stats.

An additional alteration is the placement of our league average plots. While the tab structure is helpful for organization and ease of learning, placing the league average within tabs limits users' ability to directly compare league averages alongside individual and team performance metrics. Moving these plots into a faceted, static visualization format within the main interface could facilitate side-by-side comparisons, allowing Bucks management to better gauge the Bucks' performance relative to league standards. This approach would provide a clear, at-a-glance summary of key metrics, supporting more in-depth exploration of the Bucks' position within the overall league context.