

# CSCE679: Data Visualization Project Final

## Report

Team Members:

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### Goalwise: An Interactive Insight into Team Triumphs & Trials

**MOTIVATION:** We usually observed among fantasy soccer players and fans in general that there has been a requirement for curated metrics and a way to visualize them so that they can make more informed opinions about the sport in general.

Our project aims to create a website/dashboard containing the live statistics of all the teams in the premier division of Spanish Soccer (Known as La Liga) that provides a comparative assessment of each team's current standing. Through the dashboard, we intend to visualize the measurements which are usually considered for indicating teams' performance. Some examples of this could be Team Form and Home Advantage.

**WHO:** Fans of football, sports experts, journalists, league supporters, and sports bettors would probably be the dashboard's primary target audience. The dashboard can be intriguing to football enthusiasts as well as fans of other sports.

Users with varying degrees of experience can operate the dashboard. Anyone interested in sports can be a sports analyst, journalist, casual fan, sports enthusiast, or someone who doesn't watch football closely but is inquisitive about the league and its clubs.

The visualization can be used by individuals or small groups such as friends, family, or colleagues discussing the games or analyzing performances or given the broad appeal of football and La Liga globally, the visualization has the potential to reach a large-scale public audience, especially if promoted effectively through various platforms.

**WHEN:** Several variables, such as the user's interest, the football season calendar, and the timing of important events or matches, might affect how frequently users engage with the La Liga statistics dashboard.

Weekly interactions with the dashboard are probably expected from die-hard supporters or aficionados who want to be informed about team results, next games, and score forecasts. The

dashboard can be a daily resource for professionals in the sports sector, particularly when writing articles, analyzing games, or getting ready for broadcasts.

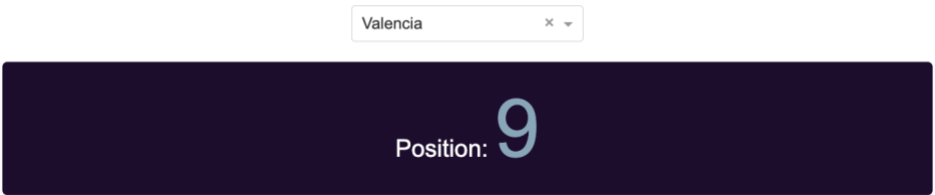
Significant events like derby matches, finals, player transfer seasons, and award announcements are likely to see an increase in user activity.

Description of Visualization

The data is primarily represented in terms of a dashboard. The different modules visualized in the dashboard are:

**Team Selection and Overview:** At the very top, users can select a team from a dropdown menu to display that team's data. The example shows data for "Valencia". The team's position in the league standings is prominently displayed in a large font size, indicating Valencia's rank was 9th at the time of the snapshot.

Team Performance Dashboard (2021-2022 Season)



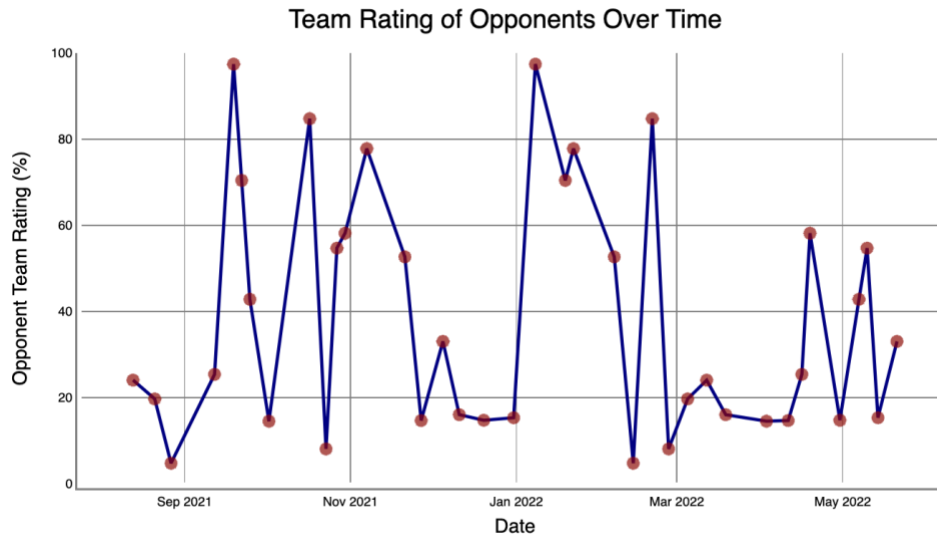
**League Standings Table:** Below the team overview, there is a table that lists all the teams in the league along with their goal difference and points. This gives users a quick reference to see how the selected team compares to others in the league standings.

#	Team	GD	Points
1	Real Madrid	49	86
2	Barcelona	30	73
3	Atletico Madrid	22	71
4	Sevilla	23	70
5	Real Betis	22	65
6	Real Sociedad	3	62
7	Villarreal	26	59
8	Athletic Club	7	55
9	Valencia	-5	48
10	Osasuna	-14	47
11	Celta Vigo	0	46
12	Rayo Vallecano	-11	42
13	Elche	-12	42
14	Espanyol	-13	42
15	Getafe	-8	39
16	Mallorca	-27	39
17	Cadiz	-16	39
18	Granada CF	-17	38
19	Levante	-25	35
20	Alaves	-34	31

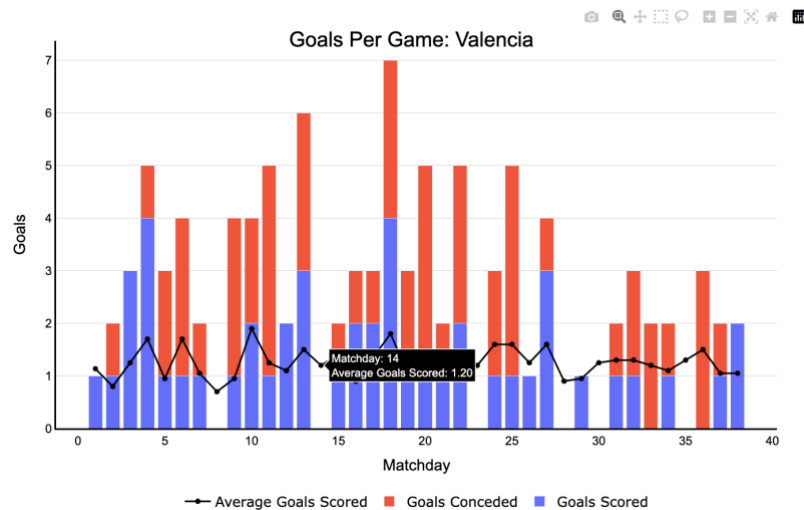
**Current Form Indicator:** Adjacent to the table, the current form of the team is presented as a percentage, providing a quick insight into recent performances.

Current form: 59.50%

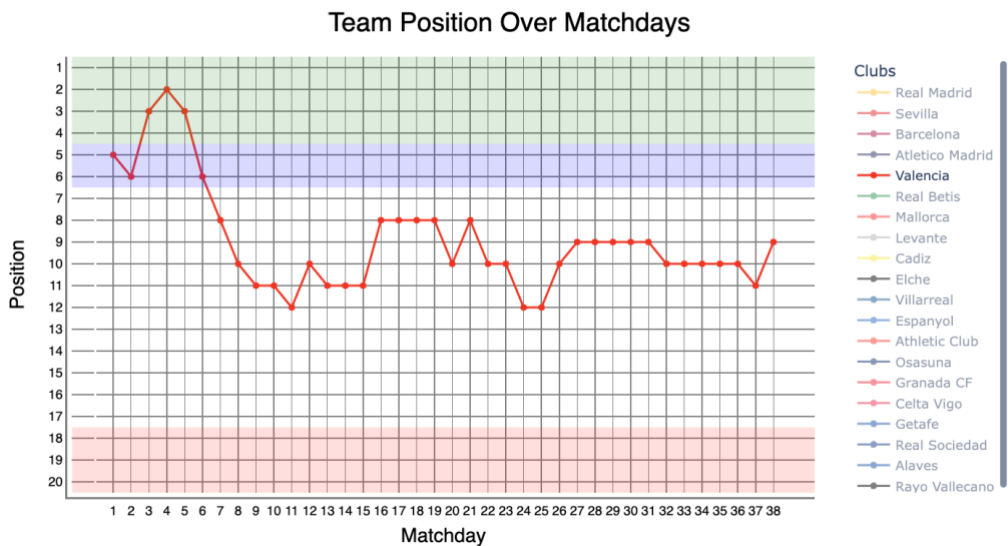
**Team Rating of Opponents Over Time:** A line chart visualizes the team rating of opponents over time. The vertical axis represents the opponent team rating, and the horizontal axis represents time, marked by dates. This helps users understand the strength of the opposition faced by the team across the season.



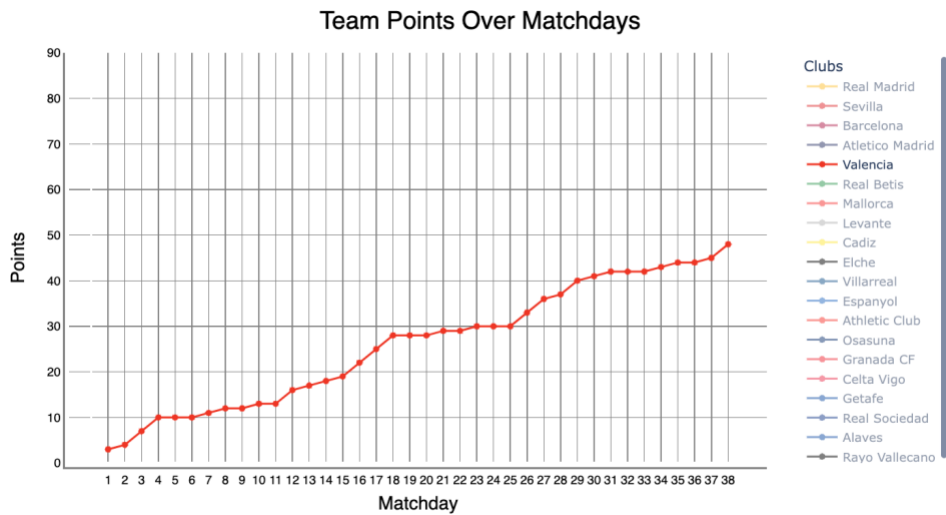
**Goals Per Game Analysis:** A bar chart displays the goals scored and conceded per matchday, overlaid with the average goals scored. This visual comparison can show consistency, outliers, and trends in the team's scoring behavior.



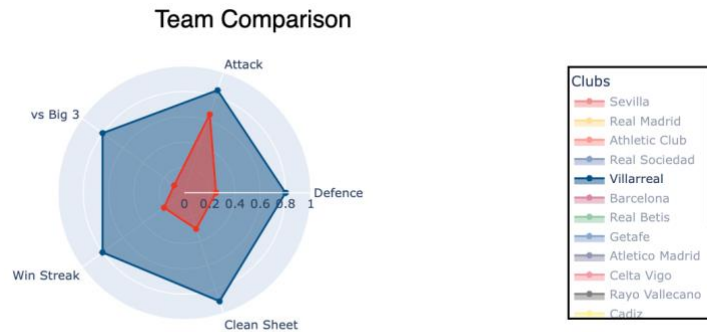
**Team's Position Over Time:** A bump chart illustrates the team's position in the league standings over each matchday. This allows users to track the team's progress or decline throughout the season.



**Points Accumulation Graph:** This line chart shows the cumulative points over each matchday, giving a clear picture of the team's journey in accumulating points across the season.



**Team Comparison Radar Chart:** A radar chart compares different aspects of the team's performance, such as win strength and defense, to other teams. This can help identify the team's strengths and weaknesses relative to competitors.



**Key Performance Indicators (KPIs):** The bottom of the dashboard features large, colored numerical indicators for "Goals Per Game," "Conceded Per Game," and "Clean Sheets," each with a rank that gives context to the team's performance in these areas compared to other league teams.

<b>Goals Per Game</b> Rank: 8	<b>Conceded Per Game</b> Rank: 16	<b>Clean Sheets</b> Rank: 10
1.263	1.395	0.3158

Users can interact with this system by selecting different teams from the dropdown menu to dynamically update all the components with the selected team's data. Hovering over the charts reveals additional details and data points, providing a more in-depth analysis. The design aims to be intuitive, allowing both casual fans and seasoned analysts to derive meaningful insights from the visualized data.

Some Examples provided:

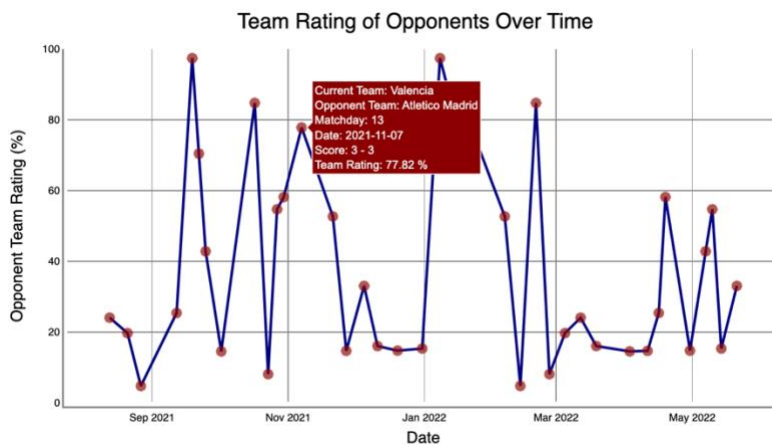


Figure: Hovering over a Marker

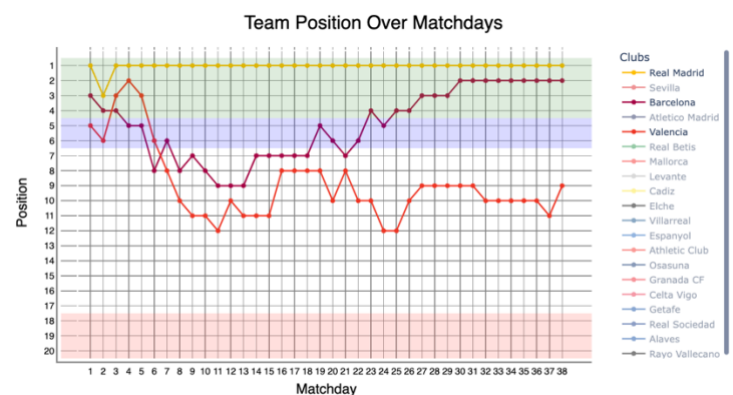


Figure: Selecting multiple teams

The intention of the dashboard's layout is to be clear and structured, guiding the user through various metrics from general to specific, with the use of color to denote positive and negative outcomes (such as red for conceded goals and green for clean sheets).

## Design Choices

In the design of the football performance dashboard for La Liga teams, several key decisions were made to align with the goals of the project, apply design principles effectively, and work within practical limitations. Here are some of the considered aspects:

Goals of the project:

**Clarity and Usability:** The dashboard aims to present complex data in a clear and understandable way, enabling users with different levels of expertise to derive insights quickly. Large fonts for critical metrics and contrasting colors for different data points facilitate ease of reading and comprehension.

**Comparative Analysis:** Providing a means to compare the selected team against league averages and other teams was essential. This is reflected in the design by including elements like the league standings table, goals per game, and the radar chart for team comparison. The color of the teams logos were also used to represent them for easier visual analysis for teams.

Design Principles:

**Visual Hierarchy:** Using size and color to establish a visual hierarchy allows users to naturally gravitate towards the most important information first, such as the team's league position and current form.

**Simplicity:** A minimalist approach was taken to avoid overwhelming the user, leading to the choice of a clean layout with a focus on essential metrics only.

**Consistency:** The consistent use of color codes throughout the dashboard (e.g., blue for goals scored, red for goals conceded) aids in learning and memory retention as users interact with the system.

**Gestalt Principles:** The design leverages principles such as proximity, similarity, isomorphic correspondence, and connectedness to group related information, making the dashboard intuitive to navigate.

Interaction Principles:

**Feedback:** Interactive elements like hover-over text provide immediate feedback to the user, a principle that enhances the interactivity and usability of the dashboard.

**Affordance:** The design uses familiar UI elements, such as dropdowns for team selection and buttons for navigation, which users can easily understand how to use.

Some additional considerations were ensuring that the dashboard is usable by individuals with various abilities may have guided the choice of color contrasts and font sizes and the design needed to be optimized for performance, with considerations for load times influencing the complexity and number of visualizations included.

## Practical Limitations:

The available metrics dictated the types of visualizations used. For instance, since certain data, like player-specific stats or heatmaps, were not readily available, the design focused on team-wide metrics and trends.

The dashboard was created with Plotly Dash, which is flexible for data visualization but does have some constraints in terms of UI elements and interactions. Therefore, the design was adapted to fit within the capabilities of this tool.

The design was influenced by the time available to develop the dashboard in that the development of core functionalities and visualizations were prioritized over additional features.

## Evaluation

Feedback was gathered from actual users, such as football fans who provided insights into the dashboard's usability and relevance. The feedback focused on the clarity of the information presented as well as the ease of navigation.

Different versions of the specific graphs in the dashboard (such as the positions graph) were presented to team members and their responses were noted to help determine which design elements are most effective.

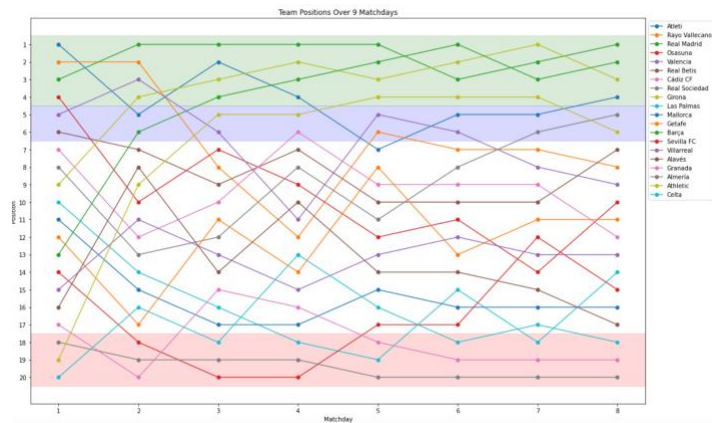


Figure: Initial Static Prototype of Positions Bump Chart

Some of the changes made through the course of our work were:

Ensuring that all interactive elements such as dropdowns, hover-overs, and navigation buttons work as intended across different browsers and devices. Also, validating that the data displayed on the dashboard is accurate and up-to-date, possibly by constantly comparing it against the official website for La Liga and assessing the dashboard's loading times and responsiveness to ensure a smooth user experience, especially when handling large datasets.

Based on user and team feedback, the layout was adjusted to better align with user expectations and improve the logical flow of information. Initial end-user interactions highlighted the need for

more interactive elements, leading to the addition of features like dynamic filtering or season comparisons.

Some additional data was presented such as presenting the whole standings table to ensure that it is both accessible to casual fans and rich enough for detailed analysis by more dedicated enthusiasts or professionals.

### Possible Improvements

Given more time and resources, the following improvements could be considered for the football performance dashboard to enhance its features and overall analytical depth:

**Interactive Elements:** Adding sliders to filter data by date range or matchdays, drop-down menus for comparative analysis between teams, and clickable elements that drill down for more detailed statistics could make the dashboard more interactive.

**Advanced Analytics:** Incorporating more advanced metrics such as xG (expected goals), player influence heatmaps, pass maps, or network analysis could provide deeper insights into the team's tactical play.

**Real-Time Data:** Implementing a system to update the dashboard in real-time as matches are played would allow fans and analysts to see the impact of ongoing games on league standings and team statistics.

**Personalization:** Allowing users to customize the dashboard by choosing which metrics to display, or by following specific teams and players, could create a more personalized experience.

**User Account System:** Creating a system where users can sign in to track their favorite teams, receive notifications, and store their preferences for repeated visits.

**Accessibility Improvements:** Enhancing the dashboard to be fully accessible to users with disabilities, following WCAG guidelines, would ensure a broader audience can utilize the tool.

**Predictive Modeling:** Integrating predictive models to forecast future match outcomes or season standings based on current and historical data could be a powerful feature for fans and betting enthusiasts.

**User Feedback Mechanism:** Implementing a system for collecting user feedback directly through the dashboard to guide future updates and features.

**Enhanced Visualization:** Exploring more advanced visualization techniques such as 3D models or augmented reality could provide innovative ways to present data.



## Software Tools Used:

We will be using the following Software and Libraries in the programming language for our following project:

**Python:** This programming language serves as the foundation for scripting the logic of the dashboard, data manipulation, and running the web server.

**Plotly:** A graphing library that creates interactive and aesthetically pleasing charts and graphs. It's used within Dash to render all the visual elements of the dashboard.

**Dash by Plotly:** This Python framework is used for creating interactive, web-based dashboards. It integrates Plotly's charting capabilities with Flask's web serving.

**dash\_core\_components:** Provides components like Dropdowns, Graphs, and other interactive elements.

**dash\_html\_components:** Offers HTML tags as Python classes for easier layout design.

**Pandas:** This library is used for data manipulation and analysis. It's likely employed to clean, structure, and aggregate the data before visualization.

**NumPy:** Often used alongside Pandas for numerical operations, it was used for more complex mathematical calculations on the dataset.

**Jupyter Notebook:** used for exploratory data analysis, prototyping visualizations, and preparing the dataset.

**Flask:** While Dash abstracts away most of the server work, Flask was be used directly for more advanced server-side operations like handling user sessions or other backend processes.

**GitHub:** These hosting services for Git repositories is where the project's code is stored, reviewed, and collaborated on.

**Heroku:** Allows the dashboard to be deployed on a cloud platform, allowing it to be accessed by users over the internet.

**CSS:** Used to style the Dash components and enhance the visual layout of the dashboard.

GitHub Link to the project: [https://github.com/sreesh2411/DV\\_Project](https://github.com/sreesh2411/DV_Project)