Visualizing Player Attributes: Transforming Data into Insightful Graphs, Heatmaps and Radar Plots

Mentor – Dr. Sujata Deshmukh (Head of Department)
Father Conceicao Rodrigues College of Engineering
Mumbai University , India

Trevelyn Noronha
Mumbai University, India
crce.9215.cs@gmail.com

Vedant Patankar
Mumbai University , India
crce.9218.cs@gmail.com

Sandesh Raut
Mumbai University , India
crce.9226.cs@gmail.com

Abstract

The concept behind this approach involves showcasing the strengths and weaknesses of players through the utilization of graphs, heatmaps, and various Radar Plots. Numerous websites gather vast amounts of data for various purposes, which we will extract through web scraping. Additionally, there will be a substantial dataset available, consisting of files in formats such as CSV and more. All this collected data will be transformed into visually engaging diagrams. The utilization of graphs enhances the readability and improves the overall experience of interpreting the data, as people generally prefer visual presentations over raw numbers.

1. Introduction

We have heard about football analyst through social media through friends the number that we see or we debate on is just the performance aspect of it but football analysis is not just limited to performance measurement it is also used in many verticals in industry. Performance : It is huge junk of football analysis you will find data such as how many goals were scored in a match and detailed such as whether given second which team were pressed ,who is playing wide that goes under performance. Federation : Federation keep the track of everything just to create set of data . Analytics is not just tracking numbers but also to create data such as how many minutes each player played even the media is not stuck in saying that this player well or not they have adopted rating system. Broadcasting : It has adopted XG in their vocabulary two experts talking about analysis with the help of analytical tool. Fan Engagement : Basic need is to fill the stadium they have adopted social media strategy so every where football analysis is used more & more. Betting : People who set the odd for each match they also use algorithm and pattern recognition to come up with the odd early it was a manual work now the algorithm does it which is much more faster and efficient

2. Literature review

1) <u>A Data Science Approach to Football Team Player Selection</u> : This paper presents a data science approach to football team player selection, focusing on

minimizing time and cost while considering player skills. The method uses powerBI and Python Pandas to analyze player performance for a new team, minimizing costs. The paper also introduces a new interactive visualization tool called "time mask" to summarize static and dynamic visualizations among team members. The approach uses a pseudo code algorithm to select players from different nations for corresponding positions, incorporating features such as skills, performance, positions, ratings, and wages. This approach can help manage and commercialize the financial profit of sports analytics.

2) <u>Machine Learning for Position Detection in Football:</u> The evaluation of motion data in professional sports has been limited due to the high cost and manual interaction required for expert evaluation. However, the availability of GPS and IMU technology has made wearable tracking devices affordable for amateur sports. This research paper demonstrates the potential of machine learning for evaluating sports activities, particularly football games. The data recording for each player starts individually but can be synchronized by GPS time. A machine learning approach based on smart analysis of velocity and acceleration in individuals and the entire team can detect position and display it on the field. Additionally, tracking devices can help identify the playing direction.

3) <u>Analyzing and Exploring the Impact of Big Data Analytics in Sports Science</u> : Data mining, also known as knowledge mining, involves extracting useful information from large sets of data. This process involves data cleaning, integration, transformation, pattern evaluation, and presentation. With massive amounts of data gathered in sports, organizations have developed specialized data analytics departments. The extracted information is analyzed using mathematical processes like predictive analytics and scientific theory. Big data has become an essential power in competitive sports, introducing numerous innovations to the industry. In professional sports, data can be used on a granular level to enhance participation of all parties involved. Examining data allows for a better understanding of the real story, rather than relying on stories, instincts, and familiarities. Big data also sets the stage for the future in sports science.

3. Methodology

3.1 Data Scraping

Data scraping is a technique wherein a program extracts data from output generated from another program. Data scraping es commonly manifest in web scraping, teh process of using an application to extract information from a website. In Python BeautifulSoup Library allows the user to efficiently and easily pull out information from HTML. In the real world, it is often used for web scraping projects.

3.2 Data Slicing

Slicing refers to a way of segmenting, viewing and comprehending data. Slicing relies on indexing. Slicing in Python is a feature that enables accessing parts of sequences like strings, tuples, and lists. You can also use them to modify or delete the items of mutable sequences such as lists.We might not require the whole dataset as whole as it may contain some information that may be irrelevant to us. We can thus slice the dataframe to include only the data that we require. We can also check if the dataset contains NULL values. Having NULL Values in the dataset might change the output. We can slice strings in python as string_object[start_index: end_index] this will return a string from starting index including the starting index uptil the ending index excluding the ending index. There might also be colums in a dictionary(dictionary is a data structure in python to store key-value pairs) that may not be of use to use. For eg. A player's country of origin is not relevant to how the player's performance is. Thus we need to slice the data and a new dictionary containing the same dataset as before except the column "Players_country". We can minimize the dataset to contain only relevant information.
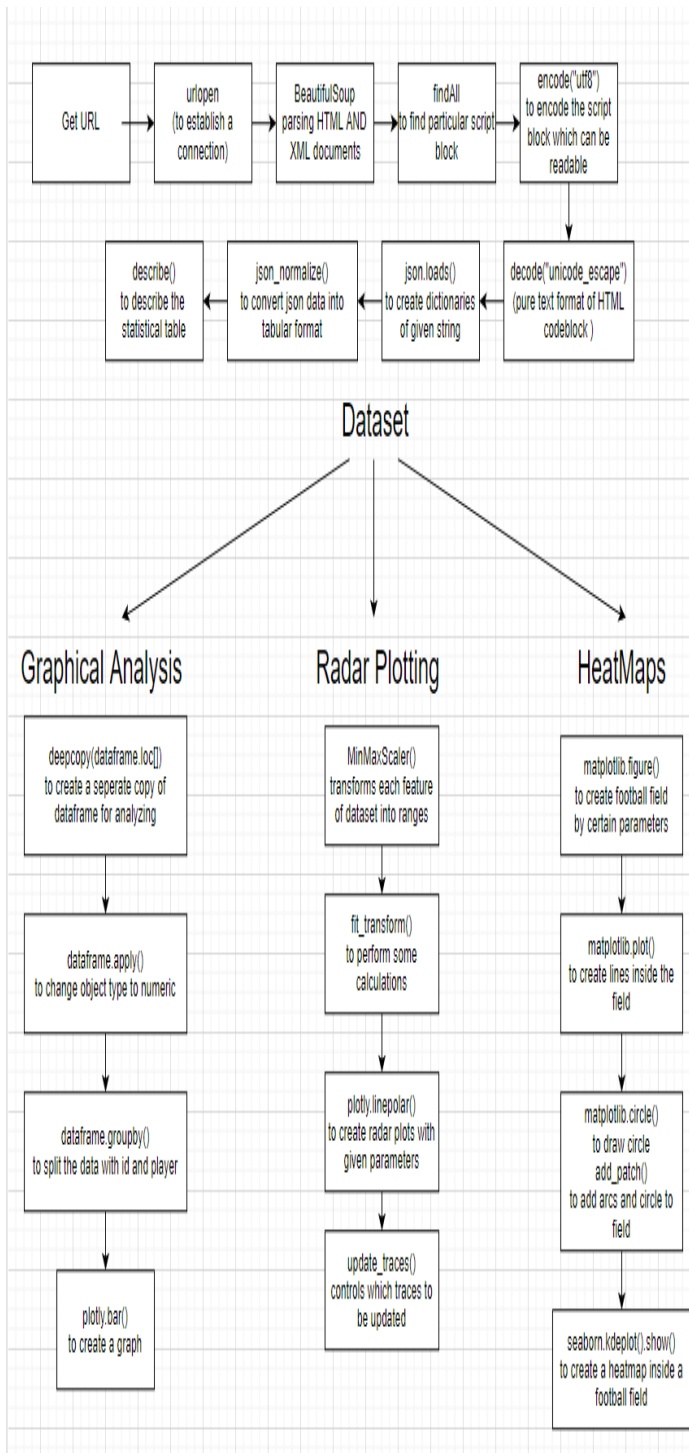
3.3 Flowchart
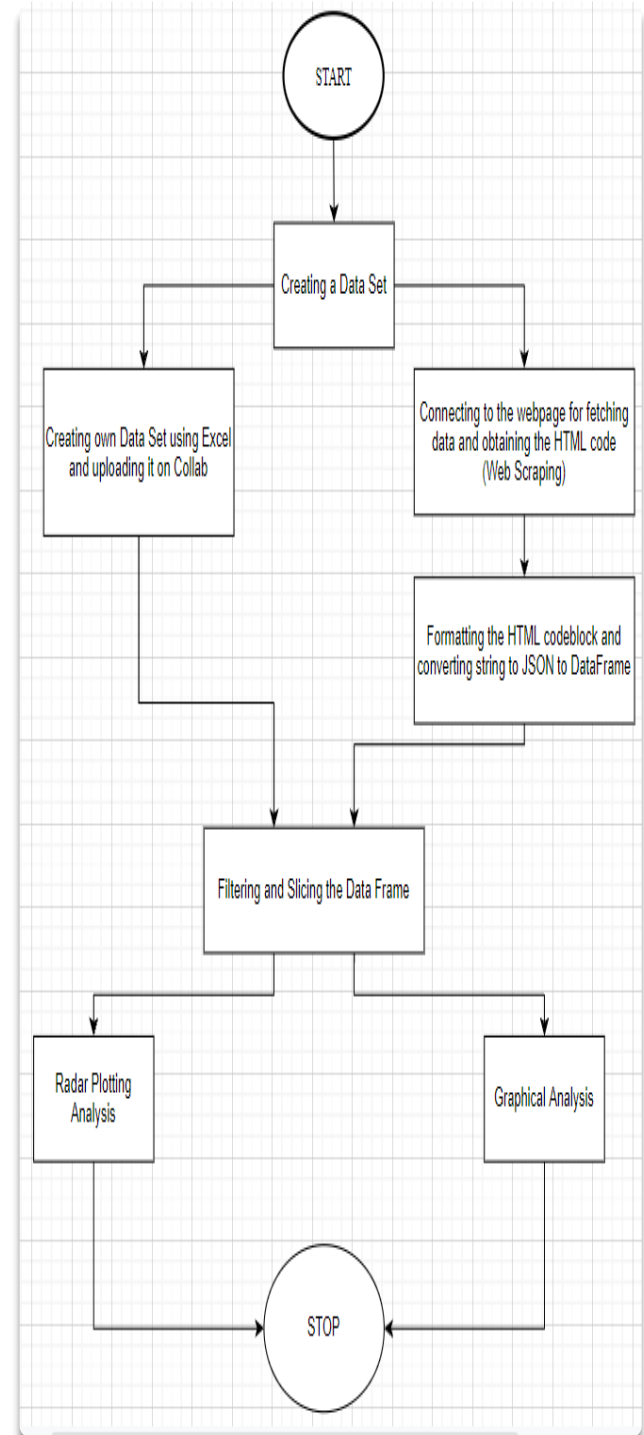
3.4 Block Diagram

3.5 Graphical Analysis, Radar Plotting & Heatmaps

A. Graphical Analysis :

First we import the libraries :
1. Pandas (converting data in rows and columns in form of a table) 2. Matplotlib.pyplot (pyplot is sublibrary) 3. Seaborn 4. Ploty.express plotting libraries 5. Json 6. BeautifulSoup

• *Getting data :*
a) Ready made data set
➢ First upload csv sheet
➢ Read the csv file
➢ Removing essential detail from the data set by slicing and filtering
b) Web Scraping
Connecting to a webpage and obtaining HTML code for it. Get the URL of the webpage. Establishing connection between python notebook and url using urlopen. Getting html code from the webpage using beautiful soup. Find a cetin code blocks from html code and converting it into json string and last converting it into pandas dataframe Plot the bar graph, scatter plot using plotting functions.

B. Radar Plotting –

▪It contains two parameter r and theta. R contains all the values and theta contains the labels
▪In order to compare the player we will need to scale radar plot using git_transform
▪Using the for loop we can make the radar plot of individual player and find the similarities among the players
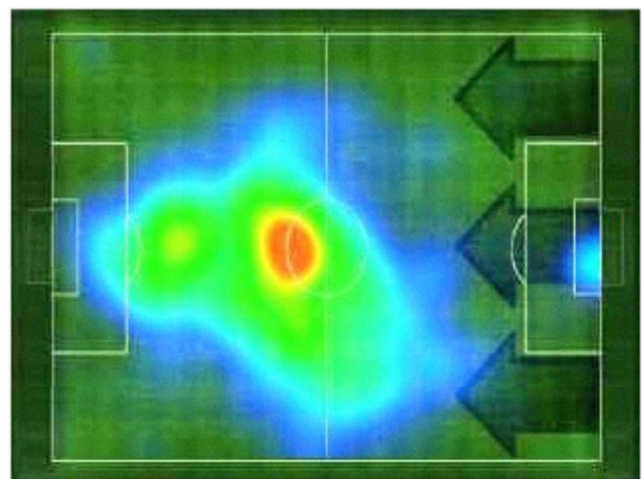
C. Heatmap -

A heatmap is a data visualisation technique which is used to represent data graphically and the values are depicted by the colour in a colour coded system. Heatmap makes it easy to visualise complex data and understand it at a glance. By plotting heatmaps of players' on-field performance, coaches and managers can identify patterns within and across games, identify performance areas that need improvement, study rival's possible game plan and strategy, as well as make data-informed decisions that benefit players, the team and ultimately business and turnover.

4. Results
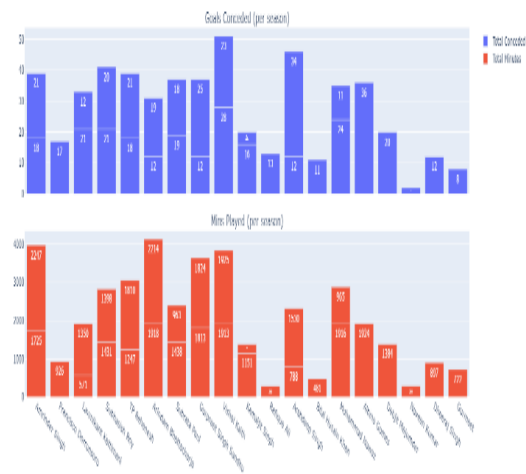
4.1 Bar graph for GoalKeeper Analysis

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4.2 Heat density map for detecting players performance

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The above heatmap depicts the on-field movement pattern of a player in terms of where he spent the most amount of time. Such data visualisation can help teams build game-changing strategies that are data-backed and more effective.By accessing such data, coaches can understand what enhances the team's performance on home turf, identify factors that negatively impact the team's performance on the opponent's turf and then use these insights to plan and strategize for better results.
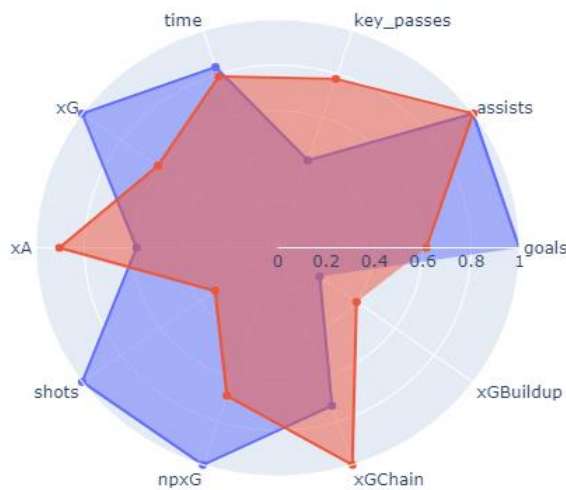
4.3 Radar Plots for player comparison

5. Applications

Player Analysis : To improve performance, players keep track of their own statistics and analyze how they played in previous games. Nutrition, training hours and game performance produce different types of statistics, such as how fast the player runs, how much weight they lift, or how much protein they ate during the day.By tracking this data and comparing it to how they felt on game day or how they performed, players can make changes to their training routines or diet to get better at their sport.

Scouting : Talent scouts typically observed potential recruits practicing or playing competitively. However, data visualizations and analytics that include statistics on past performance are also a vital part of the scouting process. Professional scouts can't always physically visit every promising collegiate player, so they rely on statistics to identify and prioritise who to visit and observe.

Team Analysis : Each player must be focused on individual performance but playing together as a team is also crucial in securing a win. When teammates adopt data science together, they can analyze how they perform together .Coaches may experiment with player combinations to see if better statistics are achieved with different lineups on the field.Using data analytics, team managers can develop techniques to identify winning player combinations and successful strategies.

Sports Gambling : Fans who gamble on sports may find data science and statistics helpful when placing bets. When gamblers can analyze a team's past performance with accurate statistics, it's much easier to predict when and where the team will be successful in the future.Statistics allow them to develop a prediction method driven by data, making gamblers feel more confident betting on certain teams or players.

6. Conclusions

The game of football has been analyzed in terms of geography, its top teams on the basis of different aspects, we have analyzed their progress through understat website and by looking at graph ,heat maps ,radar plot we have understood how the players have performed in comparison to other players that are as good as them. We have also made a comparison between players in the top 10 and teams that are rather average. This has helped us realise the importance of conducting such tournaments in countries that are less productive in the game of Football. This can inspire and motivate more players to dream bigger and perform well .

For future enhancement, Graphical : The graphical analysis is the method of analysis which performs graphing by taking the input from tables.It helps us to

compare a particular ability for different players simultaneously. Radar Plot : A radar chart is a 2D chat presenting multivariate data by giving each variable an axis and plotting the data as a polygon shape over all axes. From Radar Plot we can compare the performance of two players according to their different abilities in a tournament. Heatmap : A heatmap is a data visualisation technique which is used to represent data graphically and the values are depicted by the colour in a colour coded system. Heatmap makes it easy to visualise complex data and understand it at a glance. We are also planning to use intelligence in our project in which we can predict the performance of a player in the upcoming tournament by using the dataset we made. For example : If a user wants to know who will be the best player in the upcoming tournament then our project will help the user by providing him the data of the player's past x years (x is the input from the user) performance using predefined questions.

7. References

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