

PORTFOLIO

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Table of Contents

Machine Learning

1. PLAYRS: A Soccer Player Rating System
2. Determining the Different Types of Forwards in Soccer using Cluster Analysis
3. Projecting Players performance in a New League

In-Game Analysis

4. Set Piece Analysis
5. How Teams Posses the Ball

Video and Data Reports

6. Opposition Report
7. Scouting Report

Machine Learning

PLAYRS: A Soccer Player Rating System (1 of 2)

Aim of Project: Construct a model that predicts Match Outcome as a function of Team's performance and provide in-game Player Ratings based on their performance and positional role within the game.

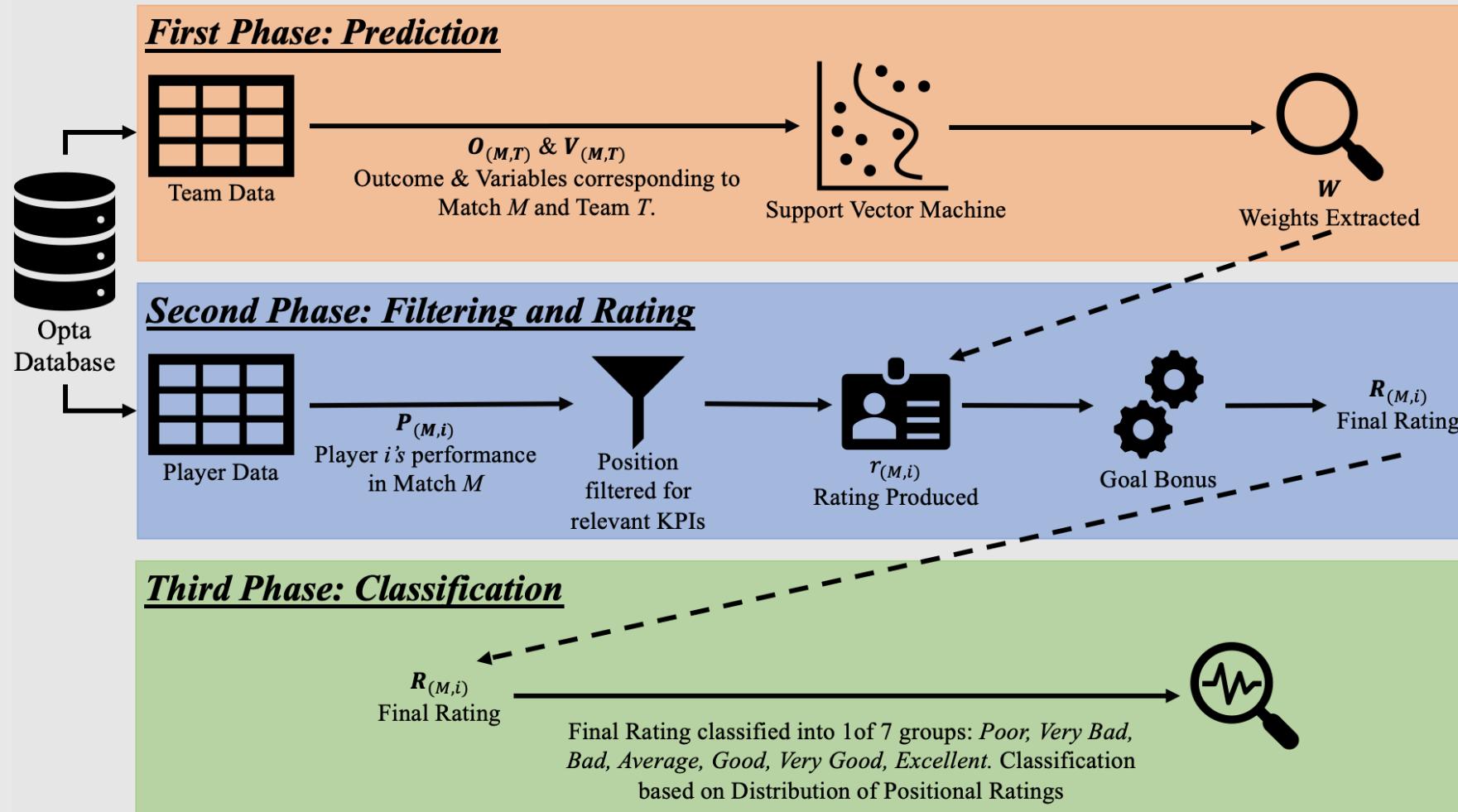
Participants: Total of 5,936 players across 11,665 games. Players must have played at least 45 minutes within the game to receive a rating.

Method: Match prediction was computed using a Support Vector Machine. Once computed, the player's performance given their positional demands, i.e. measuring Forwards on shots and Defenders on tackles, was integrated into the model to produce the ratings. Finally, a goal bonus was added for those players that scored a goal. Once calculated, those ratings were normalized between 0 and 1, then classified into a category: Excellent, Very Good, Good, Average, Bad, Very Bad, and Poor for overall positional comparison.

Results: Upon running the model, the match outcome was largely attributed to Shots On Target, Penalty Area Entries, and Crosses, with 78.6% Accuracy and .908 AUC. When computing the player ratings, there was a slight bias towards offensive players given their PIs were most related to winning. Lastly, with these ratings, coaches and scouts can monitor player's performances, support training regimes, and aide in the recruitment process, but ultimately define their own requirements for each position to ensure the player is being graded on their own criteria.

PLAYRS: A Soccer Player Rating System (2 of 2)

Layout of Model



Determining the Different Types of Forwards in Soccer using Cluster Analysis (1 of 2)

Aim of Project: Identify sub-groups of forwards in accordance to their positional demands using K-means Clustering and produce normative profiles for each group.

Participants: Total of 416 players, with at least 1,500 minutes within the last three seasons, from 8 leagues.

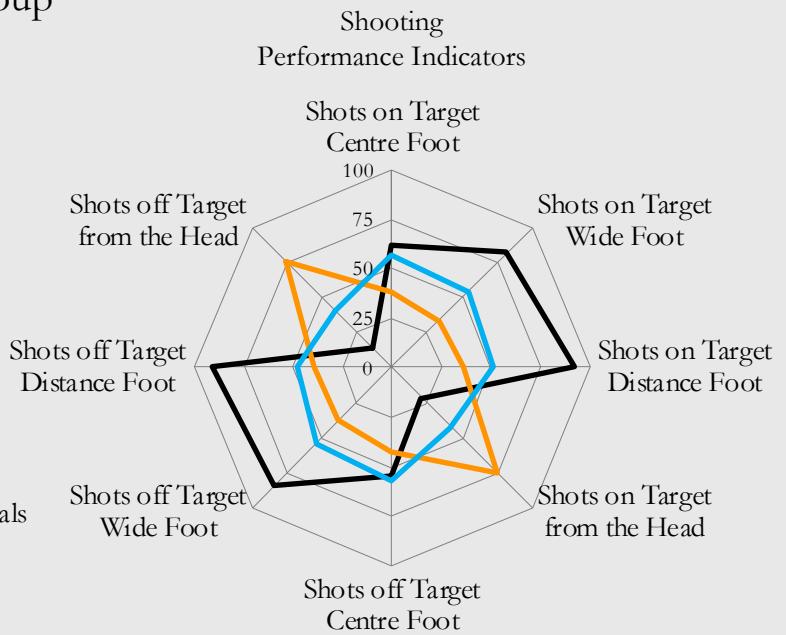
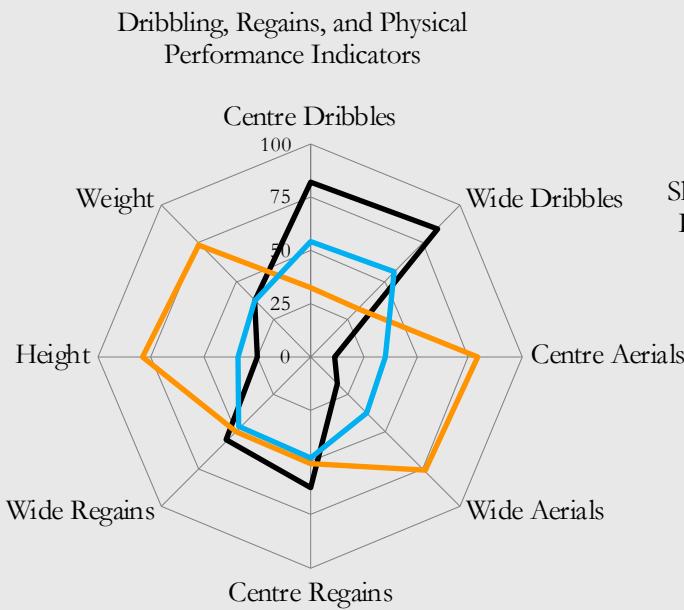
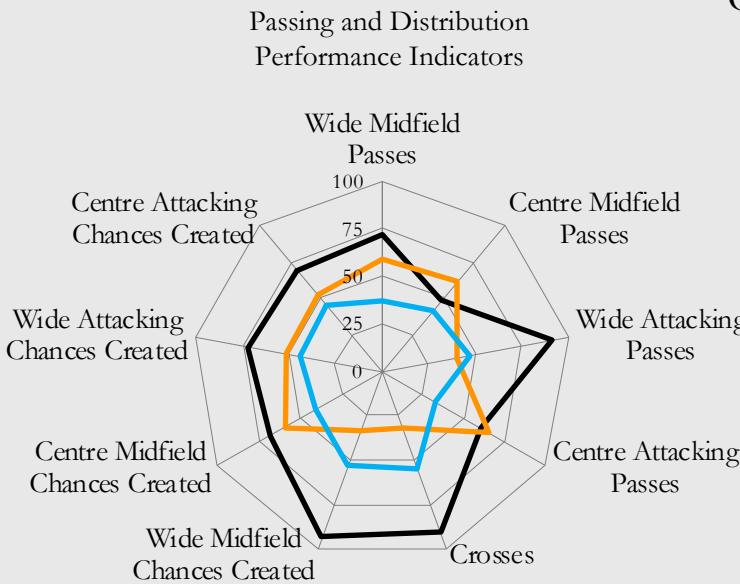
Method: To determine the appropriate number of forwards, a range of clusters were compared using Indexes such as Silhouette, Gap Stat, and Dunn Index. Once the optimal number was found, clusters were compared for statistical differences. Lastly normative profiles of players were created to better visualize the standard profile of these players.

Results: Optimal number of forwards was determined to be 3. Upon calculating the statistical differences and with the aide of normative profiles, the 3 groups were as follows: Complete, Target, and Utility. Complete Forwards tended to be players like Lionel Messi, Harry Kane, and Eden Hazard. Target Forwards were players such as Eden Dzeko and Troy Deeney, while Utility Forwards were Timo Werner, Aubameyang, and Edison Cavani for example. Scouts can utilize these profiles to better identify forwards and their expected performance.

Determining the Different Types of Forwards in Soccer using Cluster Analysis (2 of 2)

Normative Profiling:

Comparing the Average Percentile of each Group



— Complete Forwards — Target Forwards — Utility Forwards

Projecting the Performance of Players in a New League (1 of 2)

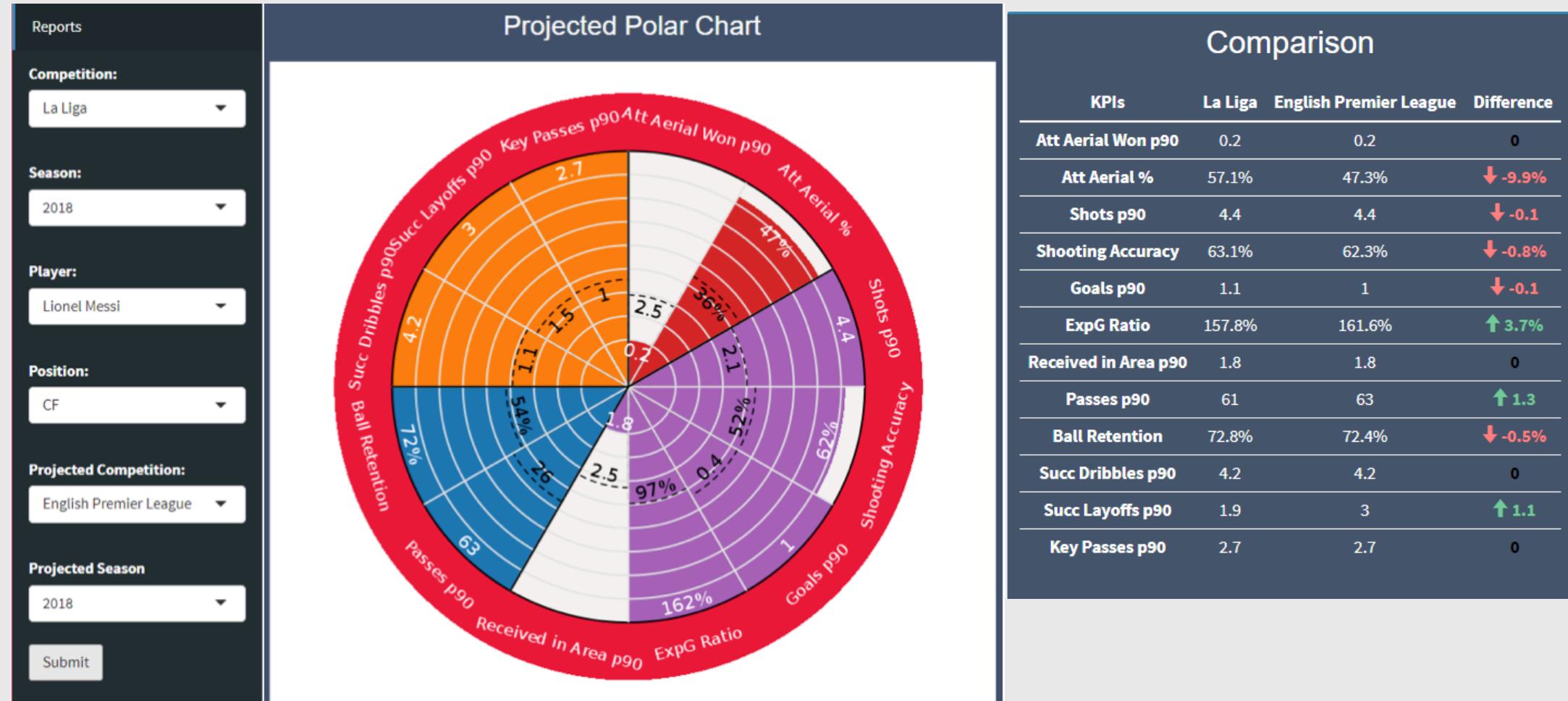
Aim of Project: Determine a player's per90 performance indicator within a new league given their current performance in their current league.

Participants: Over of 6,000 players across six seasons and 15 leagues.

Method: Each performance indicator, i.e. Goals, Passes, Tackles per90, was predicted with a linear regression using the Competition and Player. These were then taken and used to calculate a player's projected performance as the player's performance in their league plus the projected change in the new league. Lastly, these projections were uploaded to an R Shiny application to show graphical the changes in performance.

Results: Overall the regression exhibited an adjusted $R^2 = 0.73$. With this tool, Scouts can utilize this application to examine if players will be a good fit for certain leagues or not.

Projecting the Performance of Players in a New League (2 of 2)



In-Game Analysis

Set Piece Analysis (1 of 3)

Aim of Project: Decompose each Free Kick and Corner Kick to determine how best to defend and capitalize on Set Piece opportunities

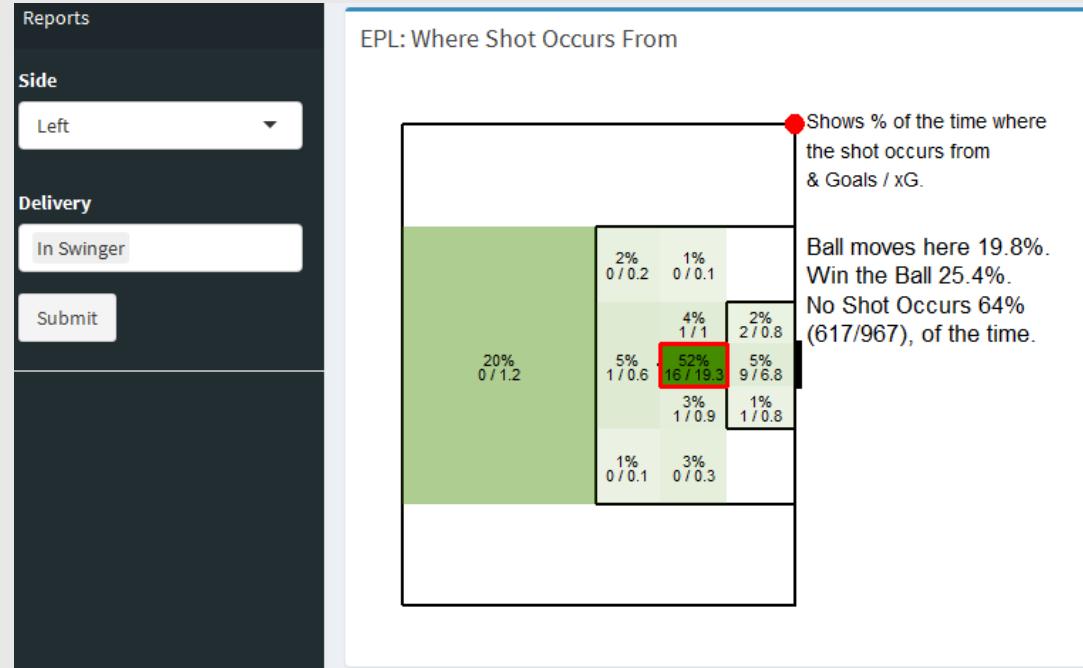
Participants: Over of 30,000 Set Pieces across five seasons in the Premier League

Method: Using R Shiny and Interactive plots, 2D maps were created, which show where the ball is kicked, where second contact occurs from, and where the first shots/shot that results in a goal occurs from.

Results: For Corners, from a Defending point of view, the key area is the front/central top of the six yard box to defend first contact and outside the 18 to get second contact. For Offensive Corners, more beneficial to move the ball to the back-post area given higher percentage of winning first contact. For Free Kicks, very zone dependent, some areas beneficial to shoot (central and top corners outside the box), while other areas better to maintain possession given the low percentage of them creating shots.

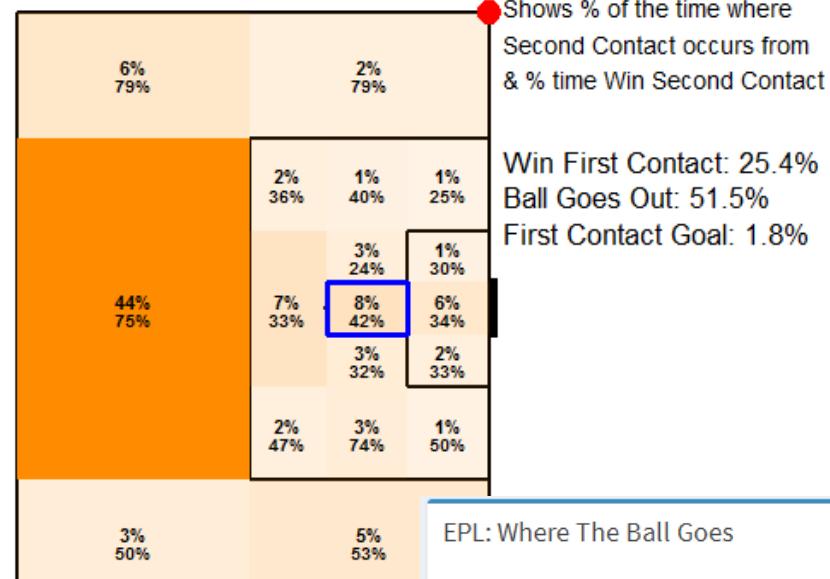
Set Piece Analysis (2 of 3)

Exert showing In-Swinging Corners from the Left

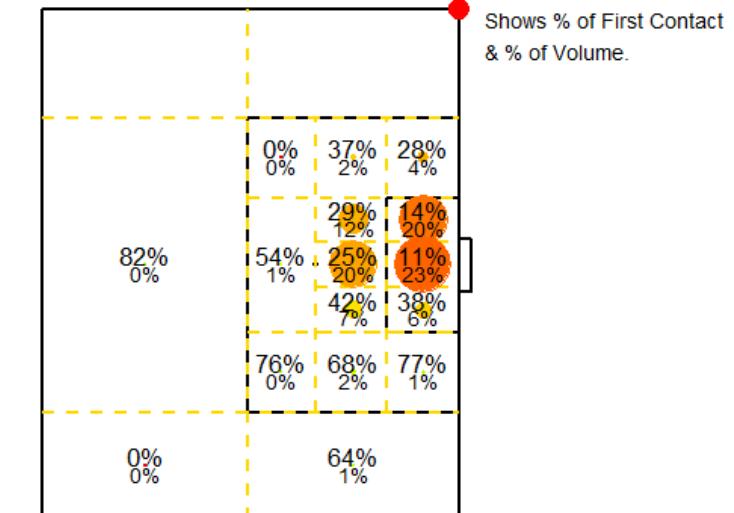


When the ball is moved towards the center of the box, shots only occur a third of the time overall in the sequence. However, maybe better to move the ball to the back post for In-Swingers from the Left given teams win the ball more often.

EPL: Contacts

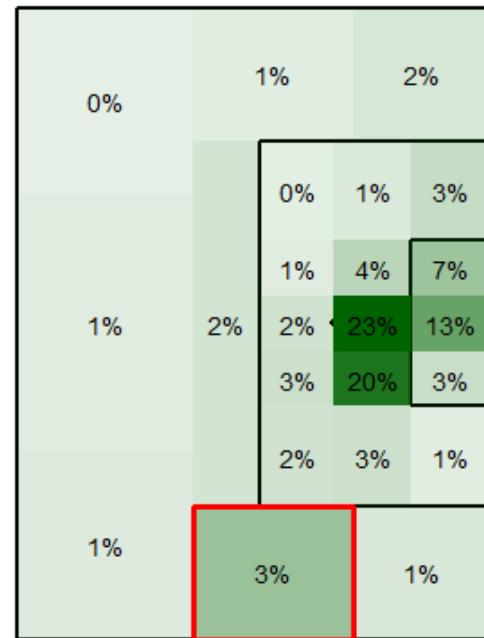


EPL: Where The Ball Goes



Set Piece Analysis (3 of 3)

EPL: Where Free Kicks Go



How Teams Possess the Ball (1 of 2)

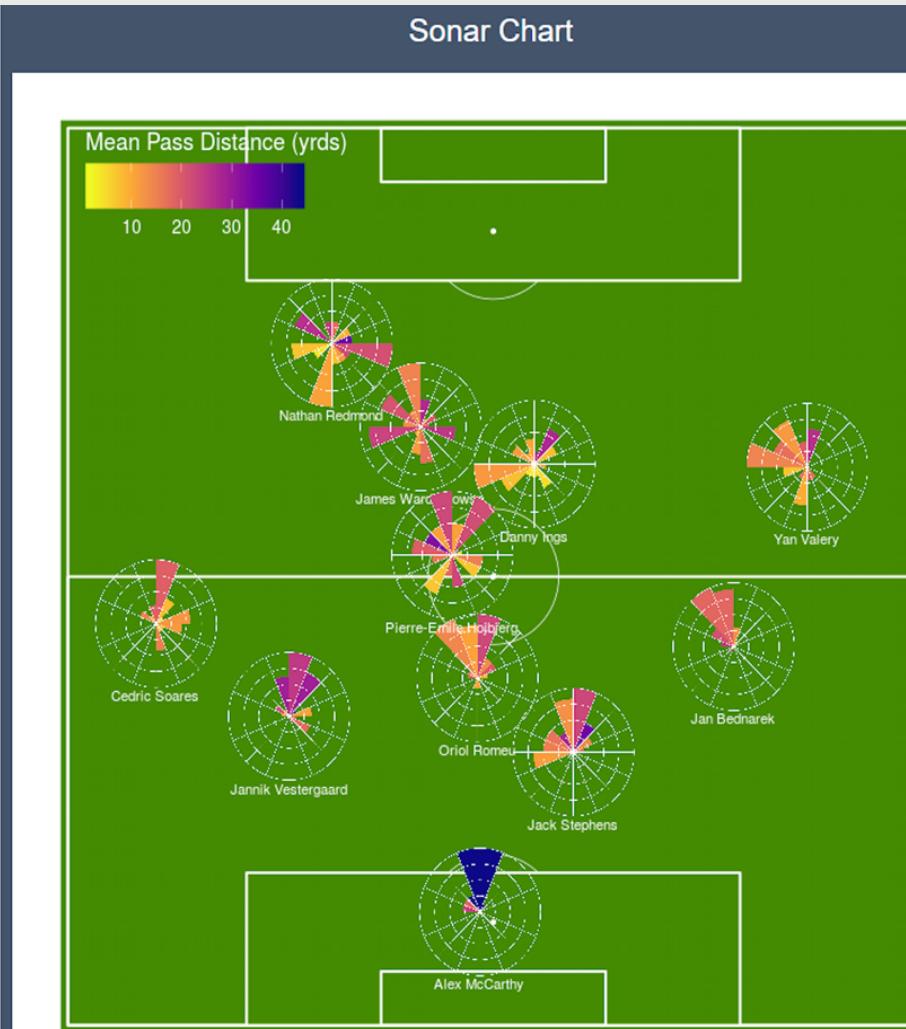
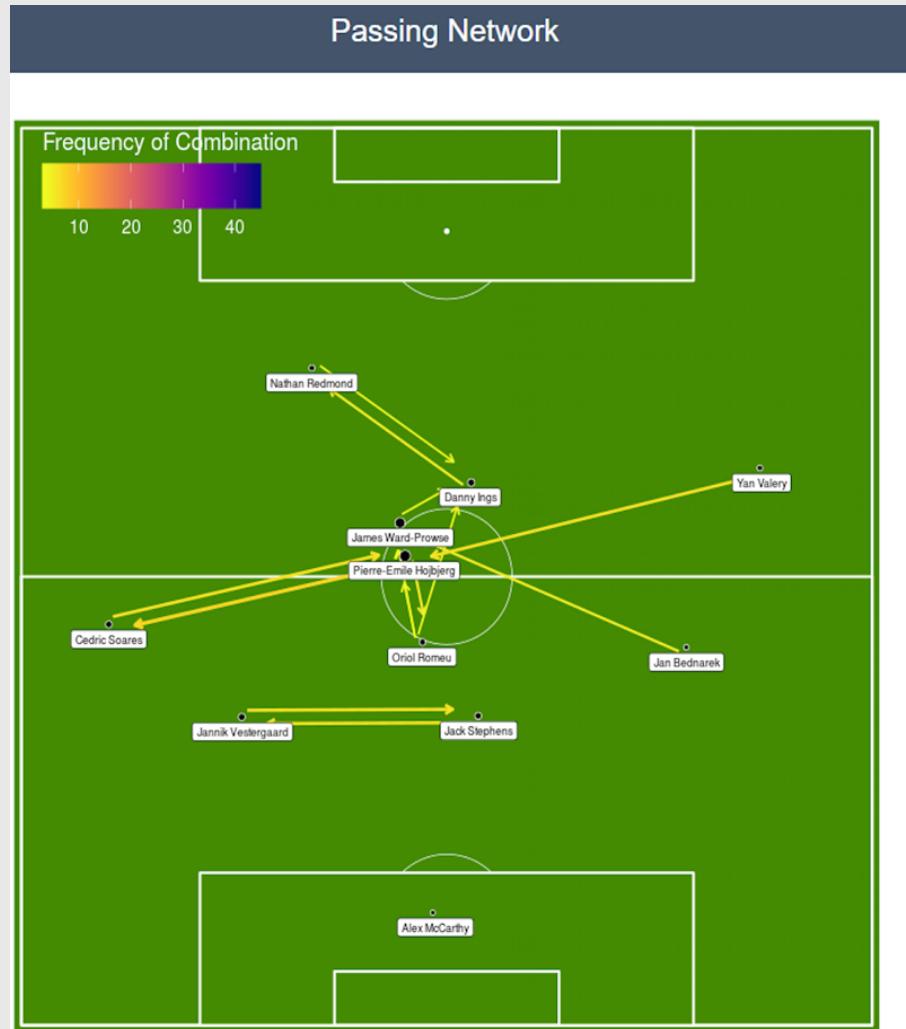
Aim of Project: Determine team dynamics analysing frequent passers of the ball and how teams move the ball based on angle and length of pass

Participants: Teams in the Premier League

Method: Using R Shiny, 2D maps were created showing the frequent passes per games between players (Passing Networks), which combined with the passing angles and distances (Sonar Charts) show how a team moved the ball.

Results: Better for teams that prefer to play with possession, e.g. Manchester City or Liverpool, rather than Long Ball teams like Burnley or Brighton Hove & Albion. From a coaching perspective, helps aid in showing the game plan or how well a team executed the game plan.

How Teams Possess the Ball (2 of 2)



Can see the main objective for Southampton was to move the ball long straight up the field with the Center Backs, then have the Central Midfielders try and distribute the ball, but the wings did little to contribute in terms of creating successful crosses, especially on the right side.

Video and Data Reports

Opposition Report (1 of 2)

The following is exerts of an Opposition Report created for the First Team Analysts for Southampton F.C.'s upcoming game against Bournemouth. Bournemouth was analysed on three main phases of play: In Possession, Out of Possession, and Set Pieces.

First Highlighted the main strengths and weakness, but also provided additional video/data on other phases of play in case of questions

Each icon was hyperlinked to a slide with the information, allowing easy access back and forth between the main page and the supporting video/data

The slide features a red header bar with the word 'Contents'. Below it is a grid of 18 items, each with an icon and a title. The items are arranged in four rows:

- Row 1:** A.F.C. Bournemouth Season Overview (soccer ball icon), Vs. Newcastle United F.C. (Newcastle United logo), Vs. Leicester City F.C. (Leicester City logo), Vs. Burnley F.C. (Burnley logo), Vs. Brighton & Hove Albion F.C. (Brighton & Hove Albion logo), Vs. Fulham F.C. (Fulham logo), Projected Starting 11 (three people icon).
- Row 2:** In Possession (runner icon), Build Up Play (star icon), Pressing Options (red star icon), Playing in the Final Third (runner icon), Counter Attacks (star icon). To the right is a green box labeled 'Goals Scored'.
- Row 3:** Out of Possession (runner icon), How they Press (runner icon), Defending the Midfield (red star icon), Defending the Goal Zone (red star icon), Defending the Counter (runner icon). To the right is a red box labeled 'Goals Conceded'.
- Row 4:** Set Pieces (X and O icon), Offensive Corners (X and O icon), Defensive Corners (red star icon), Offensive Free Kicks (X and O icon), Defensive Free Kicks (X and O icon). At the bottom is a black box labeled 'Keys to Success' and another black box labeled 'Appendix'.

Opposition Report (2 of 2)

Projected Starting 11 – Back 3



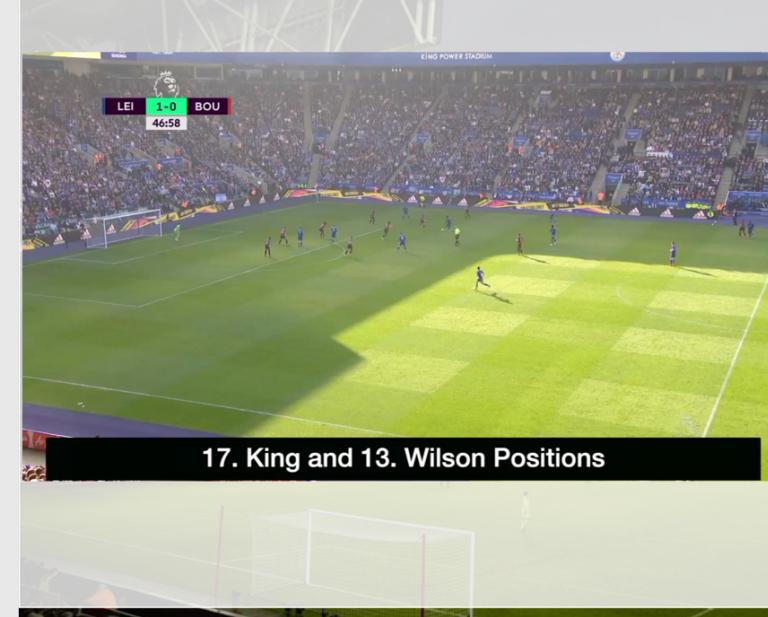
MANAGER:
Eddie Howe

BENCH

27. Begović 6'6 R (GK)
9. Mousset 6'1 R (CF)
22. Hyndman 5'7 R (CM)
25. Simpson 6'0 L (CB)
29. Solanke 6'2 R (CF)
44. Surridge 6'3 R (CF)
59. Ofoborh (CM)

QUESTIONABLE
23. Clyne 5'9 R (RB)

In Possession: Counter Attacks



- Bournemouth are very quick to break in transition having scored 6 goals from counters, 3rd highest in the league
- **13. Wilson** is on the back line ready to make a run in behind with **17. King** dropping in looking to receive to act as the QB
- **24. Fraser** and **20. Brooks** go wide as an option, but **24. Fraser** is the main threat given his speed
- **24. Fraser** likes to keep it on the wing and cross whereas **20. Brooks** will come inside and dribble
- Important to play tight and not allow them to run because they prefer to play to feet

Projected Starting 11 given their last 5 games and current injuries

Example of Counter Attacks Slide showing the embedded video and descriptions of common tactics when counter attacking

Scouting Report (1 of 2)

The following is exerts of a Scouting Report, created for the Recruitment Analysts analysing three players: Weston McKennie, Breel Embolo, and Matija Nastasic, breaking down their strengths and weakness across technical, tactical, and physical factors. Besides the Scouting Report a Final Cut Video, approximately 9 minutes per player, was created to provide video evidence of their strengths and development areas.

PLAYER OVERVIEW: WESTON MCKENNIE



Name	Weston McKennie
Date of Birth (Age)	August 28, 1998 (20)
Nationality	USA
Hometown	Little Elm, Texas
Primary Position	Centre Midfield
Height	6ft
Weight	185lb
Foot	Right
Contract Expiry	June 30, 2022
Contract Extension	September 27, 2017
Agent	Wasserman Media Group
Sponsor	Adidas

KEY STRENGTHS AND DEVELOPMENT AREAS: WESTON MCKENNIE

	STRENGTHS	DEVELOPMENT AREAS
TECHNICAL	SMART CLEARANCES, VISION, LONG THROW-IN	TACKLING, DRIBBLING ABILITY
TACTICAL	PRESSING THE BACK LINE, READING THE PLAY, BREAKING LINES	DROPS BACK LATE OR NOT AT ALL
PHYSICAL	AGGRESSIVE GOING FOR THE BALL, AERIAL ABILITY	BODY STRENGTH

Scouting Report (1 of 2)

TACTICAL STRENGTHS AND DEVELOPMENT AREAS: WESTON MCKENNIE

STRENGTHS

Pressing the Back Line

- Will force the opposition to play long and quick by running at them
- When pressing, team regained the ball 18% (3/17) of the time and caused 4 blocked passes

0845 688 9297

Reading the Play

- When facing play, able to move towards the ball and snuff out opposition's attack by intercepting/recovering their passes
- Total of 2.8 ± 1.5 Interceptions per game and 2.7 ± 2.5 Recoveries per game

Breaking Lines

- Sense of space and ability to disrupt the defensive back line given he broke their line a total of 23 times
- By breaking their line, he was targeted 10 times, but only 3 were successful because the passes were over/under hit

DEVELOPMENT AREAS

Drops Back Late or Not at All

- As a CM/CDM and opposition in middle or offensive third, he can become a ball watcher when the ball gets played through/over his head or around him
- On those instances where he did not support his defense, it resulted in 4 successful crosses and 1 goal



KEY TAKE AWAYS: WESTON MCKENNIE

TECHNICAL:

OFFERS CREATIVE SET PIECE TACTICS WITH LONG THROW-IN AND SHOWS GOOD VISION TO CREATE OPPORTUNITIES. CLEARS THE BALL AWAY AND TO THE SIDES. NEEDS TO DEVELOP BALL SKILLS AND TACKLING SKILLS.

TACTICAL:

CAN PRESS AND READ THE PLAY WELL. SHOWED GREAT ABILITY TO BREAK LINES. WHEN TURNS OFF DEFENSIVELY AND FORGETS TO DROP BACK, THE TEAM CAN SUFFER CONSEQUENCES.

PHYSICAL:

AGGRESSIVE GOING FOR THE BALL BOTH IN THE AIR AND ON THE GROUND. LACKS BODY STRENGTH TO KNOCK OPPONENTS OFF THE BALL.

OVERALL GRADE: MONITOR FOR THE FUTURE

Example of the Tactical Strengths and Development Areas identified with relevant statistics and pictures to support view.

Brief Key Take Aways to summarize the information and provide an Overall Grade.