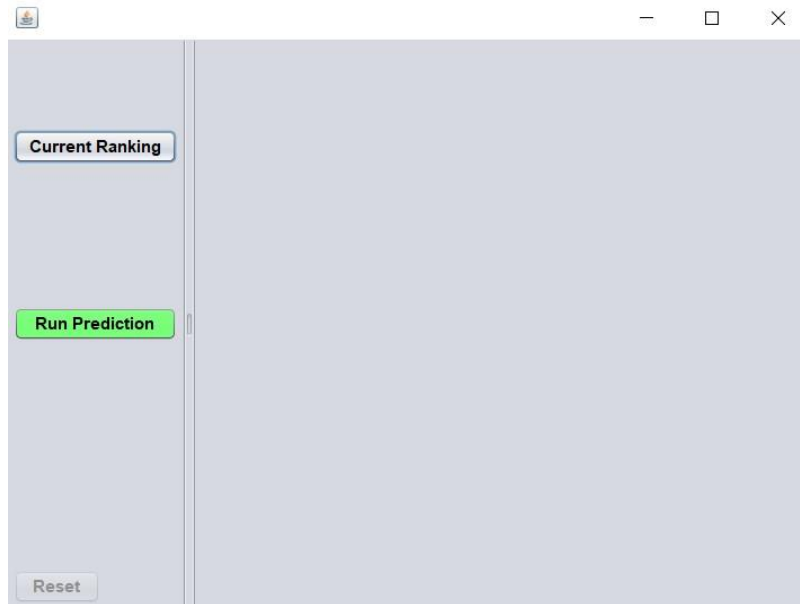


INFO 6205 Final Project: EPL Ranking System

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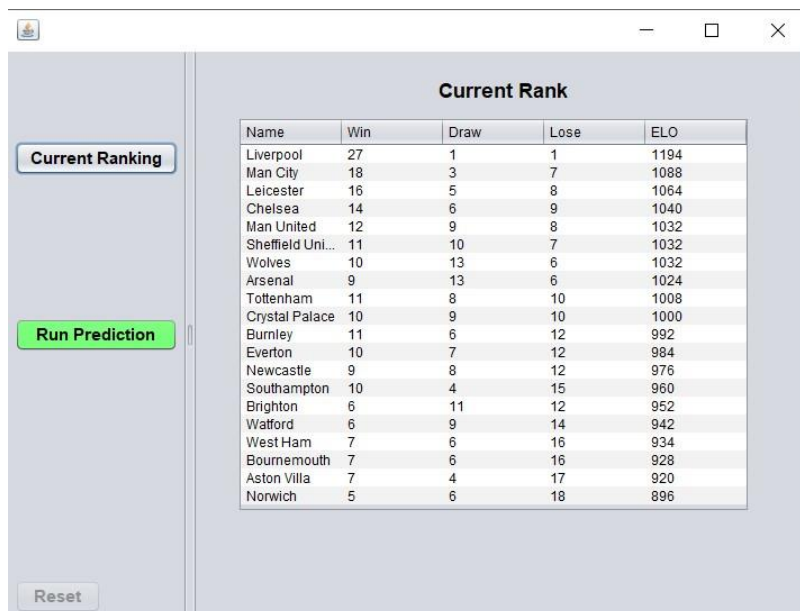
Introduction to our system:

Main page:



This is the main page of our system. User can click the button of the left side to see current ranking and can also run prediction.

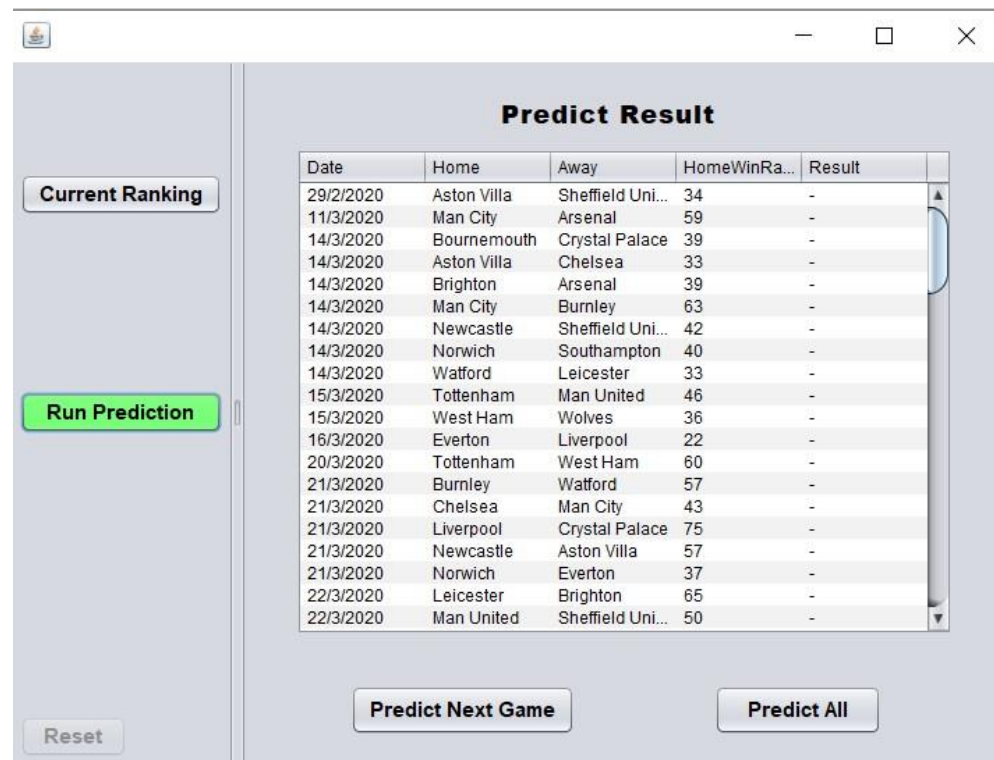
Current Ranking Page:



Name	Win	Draw	Lose	ELO
Liverpool	27	1	1	1194
Man City	18	3	7	1088
Leicester	16	5	8	1064
Chelsea	14	6	9	1040
Man United	12	9	8	1032
Sheffield Uni...	11	10	7	1032
Wolves	10	13	6	1032
Arsenal	9	13	6	1024
Tottenham	11	8	10	1008
Crystal Palace	10	9	10	1000
Burnley	11	6	12	992
Everton	10	7	12	984
Newcastle	9	8	12	976
Southampton	10	4	15	960
Brighton	6	11	12	952
Watford	6	9	14	942
West Ham	7	6	16	934
Bournemouth	7	6	16	928
Aston Villa	7	4	17	920
Norwich	5	6	18	896

Current ranking page can see the results of the games that were already played.

Run Prediction Page:



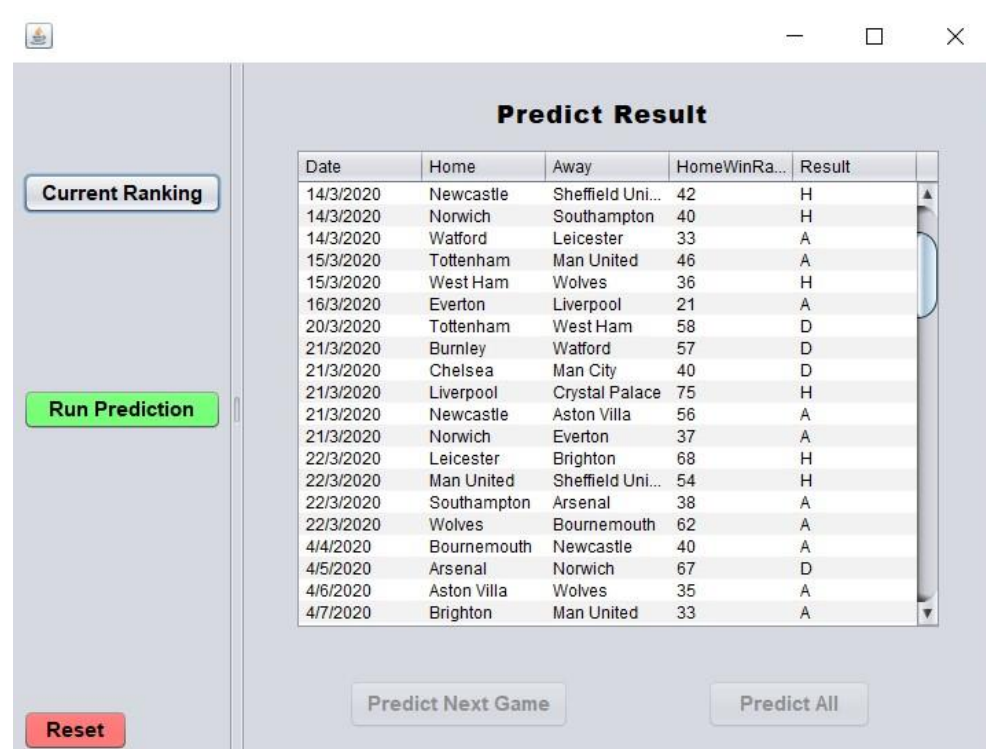
The screenshot shows a web application window titled "Predict Result". On the left sidebar, there is a "Current Ranking" button and a green "Run Prediction" button. Below the sidebar is a "Reset" button. The main area contains a table with the following data:

Date	Home	Away	HomeWinRa...	Result
29/2/2020	Aston Villa	Sheffield Uni...	34	-
11/3/2020	Man City	Arsenal	59	-
14/3/2020	Bournemouth	Crystal Palace	39	-
14/3/2020	Aston Villa	Chelsea	33	-
14/3/2020	Brighton	Arsenal	39	-
14/3/2020	Man City	Burnley	63	-
14/3/2020	Newcastle	Sheffield Uni...	42	-
14/3/2020	Norwich	Southampton	40	-
14/3/2020	Watford	Leicester	33	-
15/3/2020	Tottenham	Man United	46	-
15/3/2020	West Ham	Wolves	36	-
16/3/2020	Everton	Liverpool	22	-
20/3/2020	Tottenham	West Ham	60	-
21/3/2020	Burnley	Watford	57	-
21/3/2020	Chelsea	Man City	43	-
21/3/2020	Liverpool	Crystal Palace	75	-
21/3/2020	Newcastle	Aston Villa	57	-
21/3/2020	Norwich	Everton	37	-
22/3/2020	Leicester	Brighton	65	-
22/3/2020	Man United	Sheffield Uni...	50	-

At the bottom of the main area, there are two buttons: "Predict Next Game" and "Predict All".

After clicking Run Prediction, a table will show all the remaining games of the seasons.

After clicking Predict Next Game in below, the system will predict ONE next game each time. By clicking Predict All, the system will show all the prediction of the matchups in the rest of the season.



The screenshot shows the same web application window after clicking "Run Prediction". The table now contains predicted results for the upcoming games:

Date	Home	Away	HomeWinRa...	Result
14/3/2020	Newcastle	Sheffield Uni...	42	H
14/3/2020	Norwich	Southampton	40	H
14/3/2020	Watford	Leicester	33	A
15/3/2020	Tottenham	Man United	46	A
15/3/2020	West Ham	Wolves	36	H
16/3/2020	Everton	Liverpool	21	A
20/3/2020	Tottenham	West Ham	58	D
21/3/2020	Burnley	Watford	57	D
21/3/2020	Chelsea	Man City	40	D
21/3/2020	Liverpool	Crystal Palace	75	H
21/3/2020	Newcastle	Aston Villa	56	A
21/3/2020	Norwich	Everton	37	A
22/3/2020	Leicester	Brighton	68	H
22/3/2020	Man United	Sheffield Uni...	54	H
22/3/2020	Southampton	Arsenal	38	A
22/3/2020	Wolves	Bournemouth	62	A
4/4/2020	Bournemouth	Newcastle	40	A
4/5/2020	Arsenal	Norwich	67	D
4/6/2020	Aston Villa	Wolves	35	A
4/7/2020	Brighton	Man United	33	A

The sidebar and bottom buttons remain the same.

Math behind our ranking system:

How do we calculate Elo rating score?

In this system, we applied Elo rating system. It is a method for calculating the relative skill levels of players or teams. Team's ratings depend on the ratings of their opponents and the results scored against them. The formula we used to calculate their ELO rating is based on logistic distribution.

The exact formula is: $E_A = \frac{1}{1 + 10^{(R_a - R_b)/400}}$

Where E_A is the ELO rating of team A, R_a is their performance rating.

The formula for R_a is :

$$\text{Performance rating} = \frac{\text{Total of opponents' ratings} + 400 \times (\text{Wins} - \text{Losses})}{\text{Games}}$$

To see this in an easier way is, each team's ELO rating is started with 1000. When they win more, their ELO rating will increase more. On the other hand, when they lose, their ELO rating will drop. And the ELO rating is a big factor of the prediction system.

How did we predict each game?

In the original ranking table, we've already used all the matchup results in the season to calculate each team's ELO rating. And we set up two values (drawValue, winValue) to be the standards of our prediction. We randomly generate a integer, if the integer is larger than drawValue, away team wins; When integer is larger than winValue but smaller than drawValue, it's a draw. Every other result means that home team wins. After each game is predicted, the Elo rating will be updated(Elo rating is dynamic). So the results of the remaining games will also be affected by the predictions of our system.

Data Structures:

In the system, we mainly used ArrayList to store the win/lose data and their rating score. The reason we use ArrayList is because that we don't know how much data are waiting to be predict, and ArrayList can be growth as needed, so that's the data structure we need to stored the data.

Besides, in the Team class, we implemented `comparable<>`, and override `compare.To()` method with our own calculating way which is $\text{team1.ELO} - \text{team2.ELO}$, so it will be more convenient for us to create the system and predict the remaining games.

There's not much data structures being used in this system. The most important part of the system is the math behind our prediction method. And we believe the way we implemented it, and keep updating Elo score in our system made this prediction system very precise.

References:

https://en.wikipedia.org/wiki/Elo_rating_system

<https://metinmediamath.wordpress.com/2013/11/27/how-to-calculate-the-elo-rating-including-example/>