A SURVEY ON LEAGUE OF LEGENDS MATCHMAKING

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ABSTRACT

In this article, we will investigate the matchmaking algorithm of the game League of Legends (LoL) developed by Riot Games.

Contents

1 Introduction

With nearly 100 million active monthly players, League of Legends is one of the most popular video games in the world. In this game, players battle in classic 5v5 matches with the ultimate goal of destroying the enemy Nexus. In this paper, we focus on the Ranked 5v5 SOLO/DUO Q mode. Our aim is to evaluate if the matchmaking algorithm favors winning and losing streaks. To do this, we first evaluate a match to determine if one of the two teams is favored even before the pick and ban phase. Then we'll look at the trend of a player's matchmaking streak.

2 Match outcome prediction

2.1 Matchmaking algorithm

Riot's matchmaking algorithm is designed to find players of similar skill level for each team. It searches for suitable players for a specific match based on information provided by the lobby, such as player level and role. The algorithm is designed to ensure the highest level of competitiveness and entertainment for each game. However, it is difficult to accurately predict the outcome of a game with the available pre-lobby information. Indeed, it is difficult to determine whether one group of players has an advantage over the other before the selection and banning phase.

Therefore, it is useful to predict the outcome of a game based on pre-lobby information to see if the matchmaking algorithm can favor winning and losing streaks.

-Skill based matchmaking (SBMM)

-Engagement optimized matchmaking (EOMM)

2.2 Features

As explained above, two teams of 5 players compete, the blue team and the red team. We want to predict the outcome of the game, from the pre-lobby information.

Target :

- **win** : winning team

Features :

- **avg_rank_blue_team** : average rank of the blue team
- **avg_rank_red_team** : average rank of the red team
- **avg_winrate_blue_team** : average winrate of the blue team
- **avg_winrate_red_team** : average winrate of the red team
- **avg_kda_blue_team** : average Kills Death Assists (KDA) of the blue team
- **avg_kda_red_team** : average Kills Death Assists (KDA) of the red team
- **avg_cs_blue_team** : average Creep Score (CS) of the blue team
- **avg_cs_red_team** : average Creep Score (CS) of the red team
- **nb_autofill_blue_team** : number of autofilled players of the blue team
- **nb_autofill_red_team** : number of autofilled players of the red team

Here is the correlation matrix of our features:

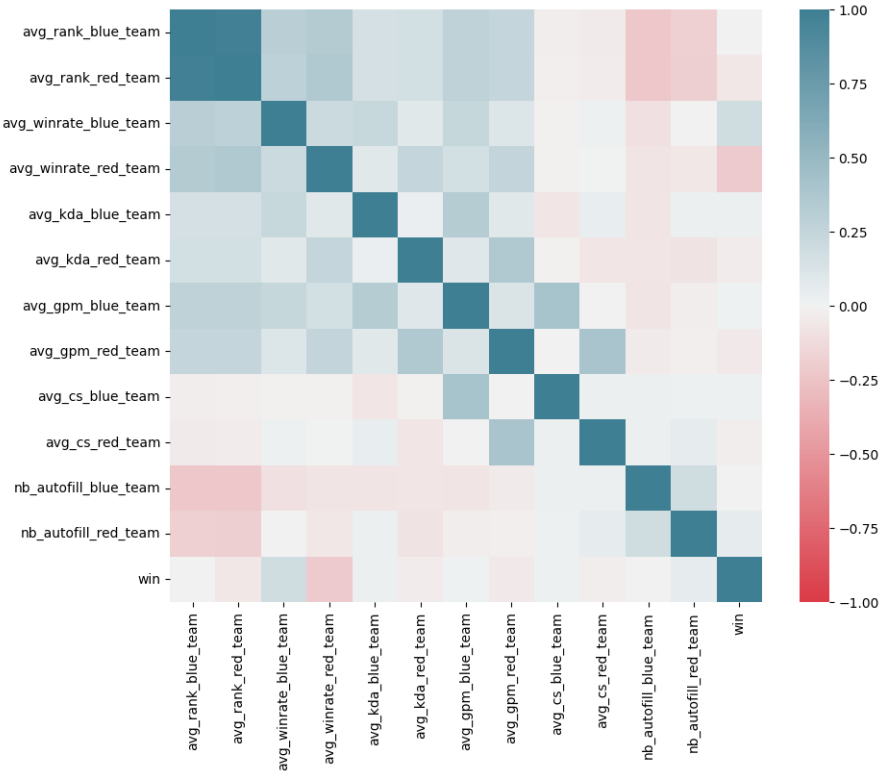

Figure 1: Correlation matrix

We can notice a strong correlation between the victory and the average winrate of the teams.

2.3 Model

After having created a database, thanks to the riot api, we look for a simple model which allows us to estimate the chances of winning for each of the 2 teams.

Model	Accuracy	Balanced Accuracy	ROC AUC	F1 Score	Time Taken
LogisticRegression	0.65	0.65	0.65	0.65	0.03
LinearDiscriminantAnalysis	0.65	0.65	0.65	0.65	0.02
RidgeClassifierCV	0.65	0.65	0.65	0.65	0.02
RidgeClassifier	0.65	0.65	0.65	0.65	0.02
CalibratedClassifierCV	0.64	0.64	0.64	0.64	0.21
LinearSVC	0.64	0.64	0.64	0.64	0.06
SVC	0.64	0.64	0.64	0.64	0.18
SGDClassifier	0.63	0.63	0.63	0.63	0.02
LGBMClassifier	0.63	0.63	0.63	0.63	0.14

Figure 2: Models performances

Logistic regression seems to be adapted to our situation. So, even before the game lobby starts, we can predict a little less than 2 times on 3, which team will win.

3 Summoner streak study

3.1 Loser/Winner queue

The "loser queue" and "winning queue" refer to matchmaking trends that favor winning and losing streaks for a player. The "loser queue" occurs when matchmaking continues to assign the same player to losing teams, creating a losing streak. The "winning queue" occurs when matchmaking assigns the same player to winning teams, creating a winning streak. These matchmaking patterns may be the result of a poorly designed algorithm or an implicit bias in the algorithm. These matchmaking trends are frequently mentioned by streamers and professional League of Legends players.

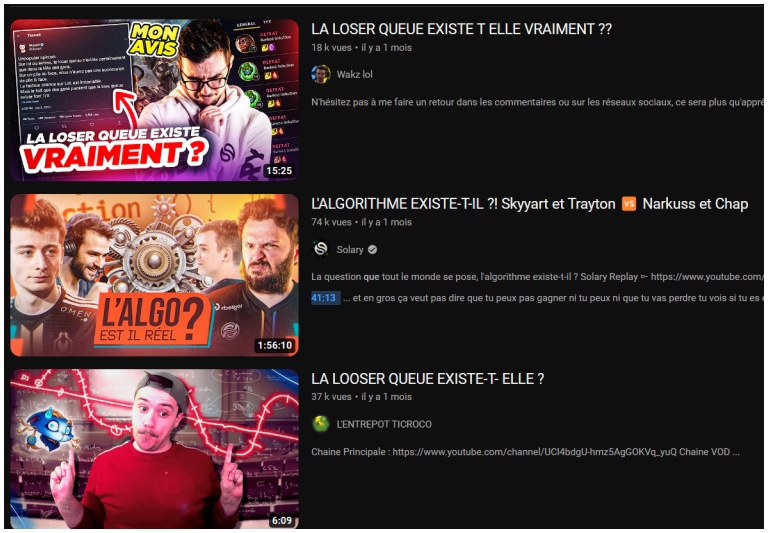

Figure 3: Youtube content on matchmaking algorithm

However, it is difficult to determine whether these trends experienced by players are the result of the matchmaking algorithm or a psychological bias of the player.

3.2 The Narkuss case

Let's take for example Narkuss, a french streamer, member of the web TV Solary. He frequently complains on social networks about this famous "loser queue".

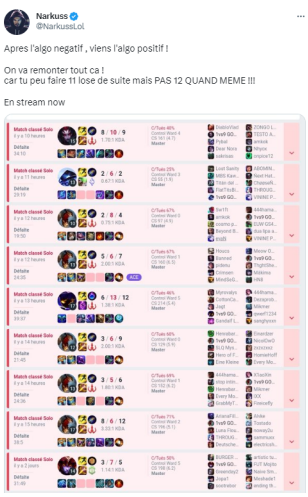

Figure 4: Narkuss lose streak

We analyze the games of the patch 13.1 of Narkuss :

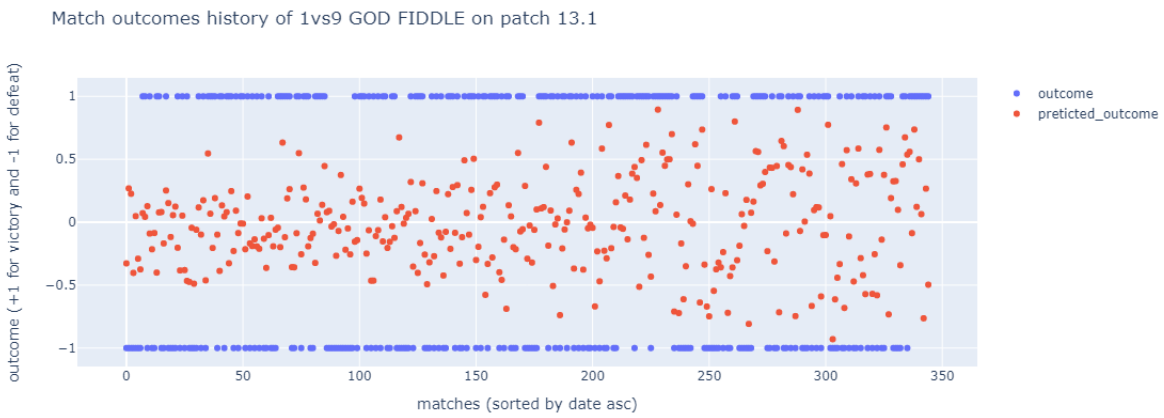

Figure 5: Match outcomes history of Narkuss on patch 13.1

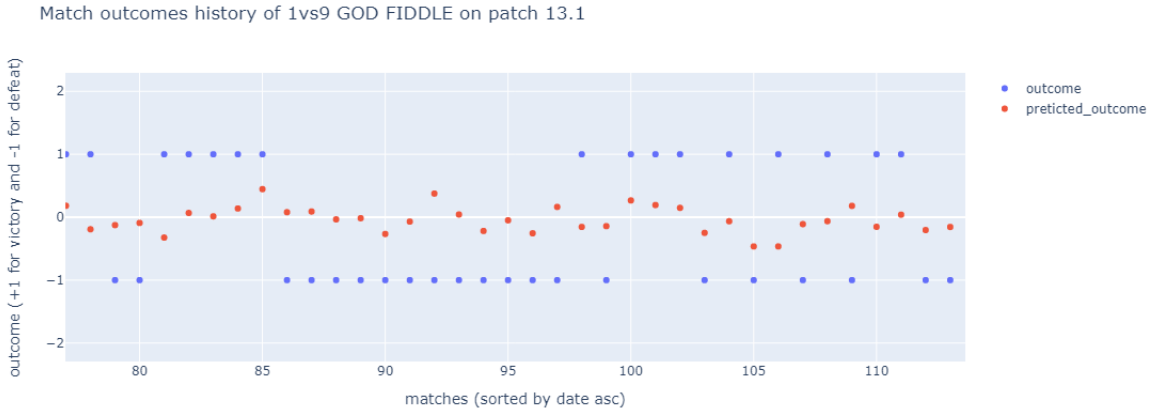

Figure 6: Match outcomes history of Narkuss, losing streak zoom in