

IRS-MRS-2020 Practice Module Report

LOL Smart Ban/Pick Assistant

Group 20:
Wen Cheng A0213572L
Du Yiming A0165454B

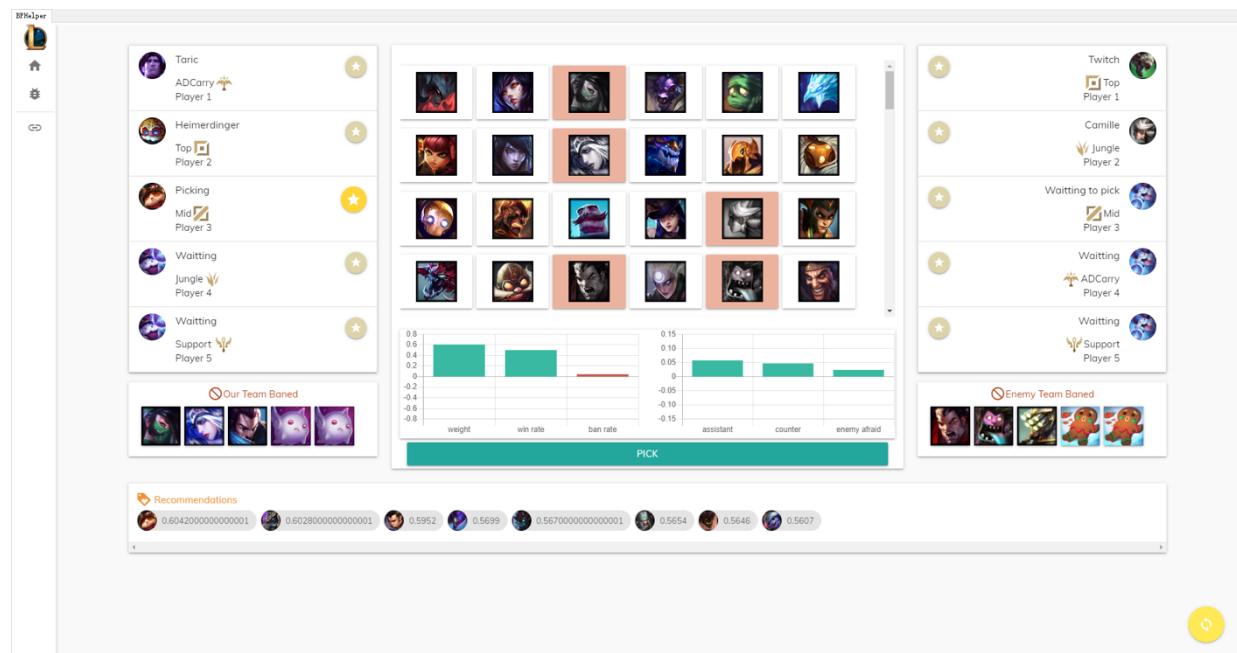


Table of Contents

EXECUTIVE SUMMARY	3
BUSINESS VALUES	4
BACKGROUND	4
MARKET RESEARCH	5
PROJECT OBJECTIVES	6
PROJECT SOLUTION.....	6
SOLUTION OVERVIEW.....	6
SYSTEM ARCHITECTURE.....	7
KNOWLEDGE ACQUISITION & REPRESENTATION.....	8
DYNAMIC RULE-BASED MODEL	10
BAN/PICK UI.....	11
PROJECT VALIDATION/FEEDBACK	12
PROJECT CONCLUSION	12
APPENDIX.....	13
PROJECT PROPOSAL	13
MAPPED SYSTEM FUNCTIONALITIES	13
INSTALLATION & USER GUIDE	13
INDIVIDUAL PROJECT REPORT	14

Executive Summary

From 2010 until today, League of Legends (LOL) is certainly one of the most popular multiplayer online battle arena video games out there, with more than 100 million active players across the world, it had won the ‘Best eSports Game’ and ‘Best eSports Event’ in *The Game Awards 2019* competition and countless other awards from past few years. It is for sure that most of us have heard of this game and many our friends or even ourselves actually play the game. There are many reasons behind the success of League of Legends, it is a totally free-to-play game where players do not have to spend a single cent and he is able to enjoy the game just like others. It also has fantastic visual effects and does not require high hardware specs from the PC.

But the most important reason for the game to continually being the top video game in the world is the nature of the game: teamwork, competitiveness and fast pace. It is a 5 vs 5 multiplayer game that each player will select a champion and work together with his team intensively to destroy enemy team’s towers. Each player’s champion will have its own unique skills and stats and the player has to find the best hero that matches his team’s draft and at the same time it is the best against the enemy’s draft during the ban/pick phase.

This is where our product comes in to help, with nearly 150 champions available in the pool, players normally pick and ban champions based on their own experience and understanding. But with such big amount of choices, player may not have a clear sight on which champions to pick so it best matches their own draft and in the meanwhile best counter the enemy’s team, and which champions to ban from the pool so the enemy team is not able to pick them. It is a very complex network of counter and coordinate relations, and our product aims to help players with this process of decision making by using the knowledge extracted from the game data we collected from the community. To assist the players come up with the best draft and ban list that leads to the highest overall win rate.

Business Values

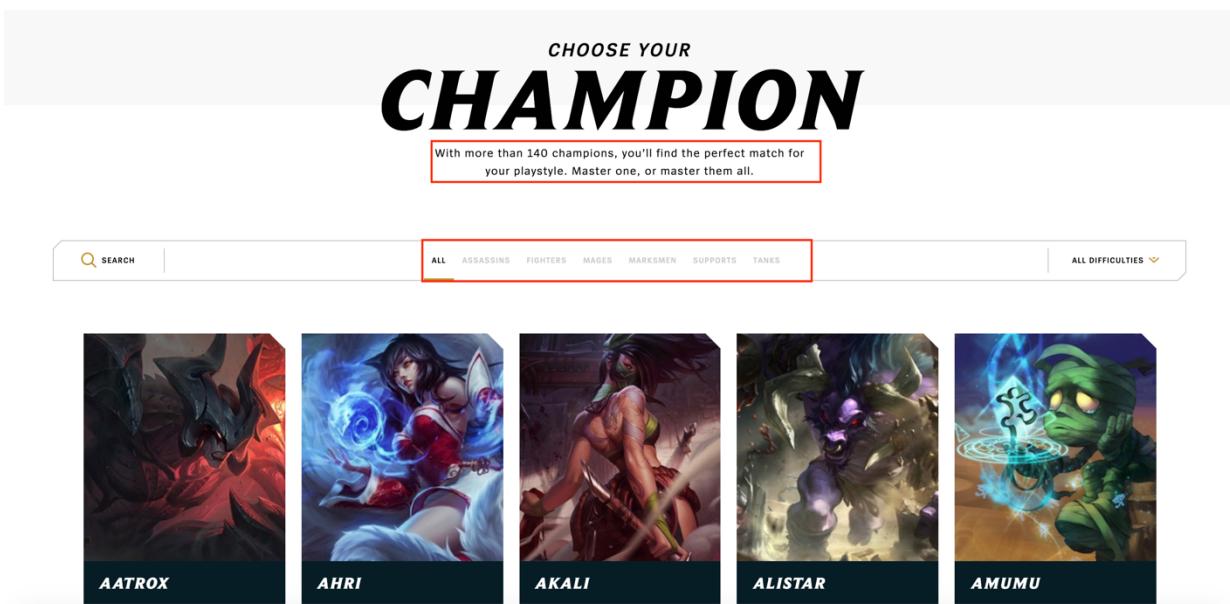
Background

For most multiplayer online video games like League of Legends, players would mostly be focusing on how to best use the champion and work together in game with his teammates to win the game. And they do not always win the game in the end even they believe they have given their best effort and played very well. This will usually lead to frustrations and even conflicts and fights between the players.

They may have actually played very well and worked together with the team, but what they may not be aware is that their team draft is in disadvantage even before the game starts.

What make League of Legends so special is the variety of champions, with 148 champions available in the pool and each champion has its own unique skills and roles, some champions are naturally good against certain champions and some naturally works better with certain champions. For example, a champion with high body armour counters a champion with high physical damage because in the game body armour would reduce physical damages. Also, a champion with high magical damage will work best with a champion who can reduce the magical resistance of the enemy.

There are many other aspects in the game that can affect the counter/coordinate relations between champions and for players it is impossible to have a clear picture of the complex network of the relations. Players also only will have limited amount of time for the ban/pick which makes it even harder for them to make the best decision.



(More than 140 champions, with different roles, picture from

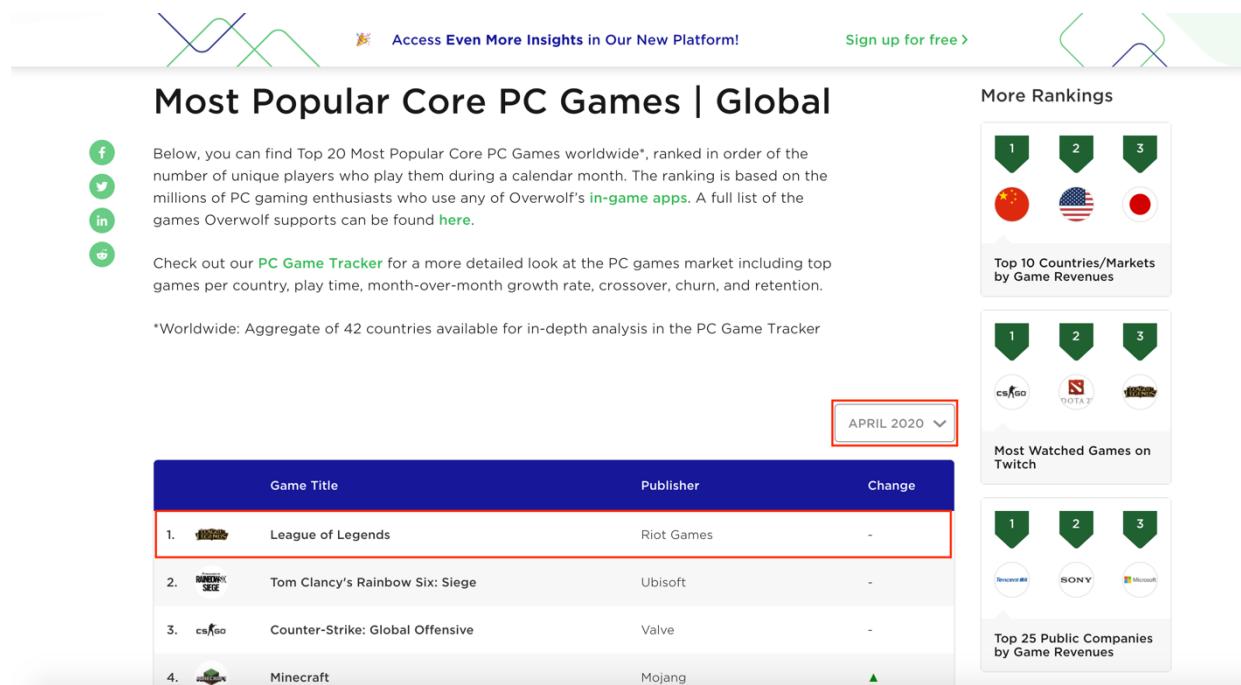
<https://na.leagueoflegends.com/en-us/champions/>)

Market Research

Even though League of Legends is a free to play game, players across the world are more than willing to spend lots of money in the game, making it one of the highest-grossing game in the world. With annual revenue of 1.4 billion USD in 2018 and 1.5 billion in 2019, the stickiness of the community is certainly very high thanks to the constant update from the game company. Thus, the potential market of our product is indeed very huge.

Team researched their counterpart in the market, DOTA2, which is also a free to play multiplayer online battle arena video game and LOL actually derived from it. DOTA2 has a subscription service called DOTA PLUS which gives the subscribers exclusive access to the game assistant. It gives recommendations to not only the ban/pick phase, but also skill build and item build based on their big data, basically it will give suggestions for most aspects of the game from the beginning to the end of every game.

Our team was inspired by this service and realized that LOL does not have such functions at all, and by developing such tool, it will definitely help players to have a better and smoother gaming experience which they will be happy to pay for.



(As of April 2020, League of Legends is still the most popular PC game, source:

<https://newzoo.com/insights/rankings/top-20-core-pc-games/>)

Project Objectives

The objective of the project is to help the League of Legends players to come up with the ban/pick decisions so the overall win rate of the draft will achieve maximum. It will allow user to get the latest game data based on their own region and skill level, also make all the ban/pick decisions in an intuitive UI to reduce the time to adapt to new interface.

Project Solution

Solution Overview

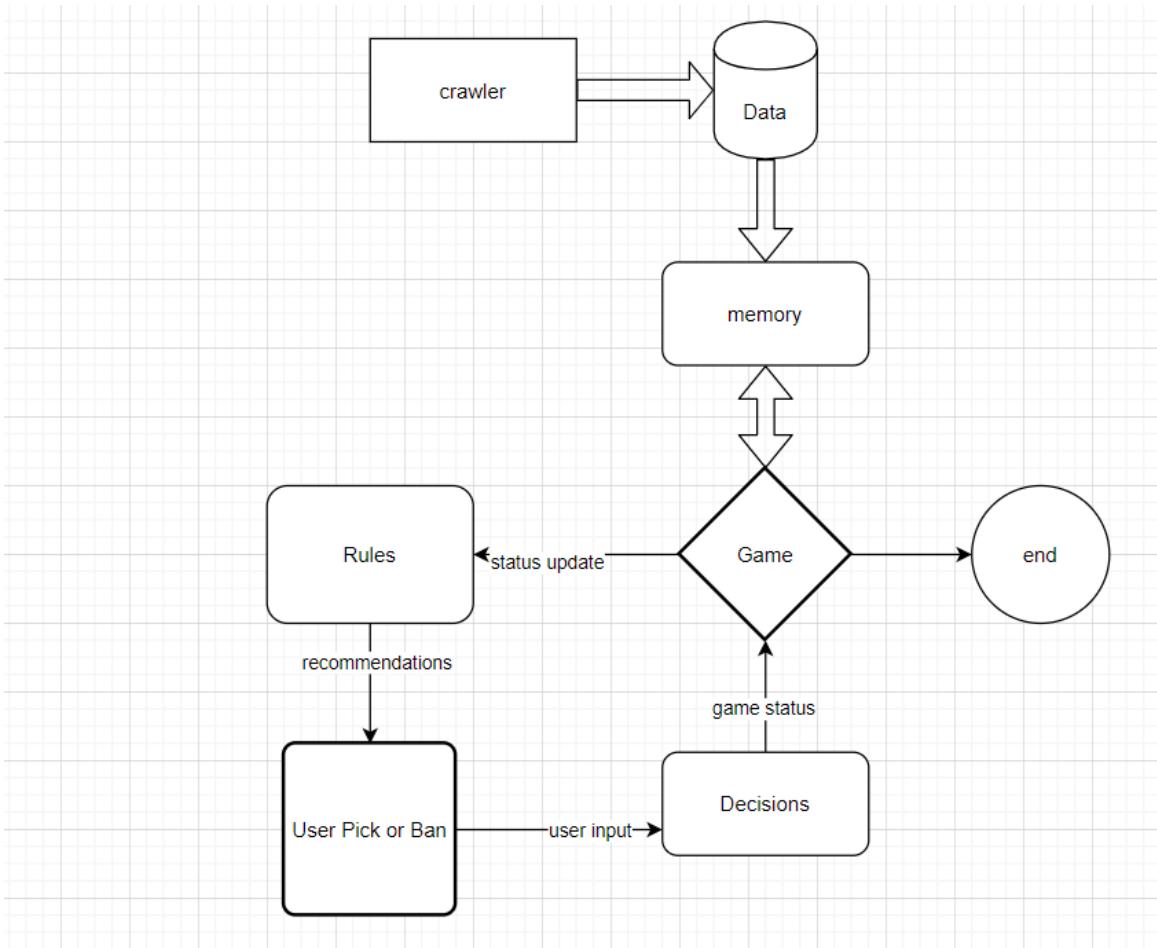
To help player with the ban/pick phase to come up the best draft, we will be collecting and using open source game data from all regions of the world which is available online. The data will be fed to our reasoning model and the system will make recommendations based on the user inputs.

In the actual scenario, there are many other unpredictable factors that will affect the decision including runes, summoner skill and player's playstyle etc. For our system, we will be focusing on

- Individual champion counter relation (pick the champions that counter the enemy's team, ban champions that counter user's team)
- Teammate champion coordinate relation (pick the champions that go best with user side already picked ones, ban champions that go best with enemy already picked ones)
- Role assignment (5 roles must all be filled with right champions)
- Overall win rate and ban rate for each champion

To make the best decision for the player, the system will implement a dynamic reasoning system which will cover the above aspects.

System Architecture



The above diagram shows the overall system architecture of our product, where in the beginning, user will decide which set of data will be used for reference. The data will vary slightly across different regions and will be very different among different rank levels and user can choose the one that suits him best. Once we have the data from the data crawler, it will be stored in the local machine in csv format and loaded into the memory which will later be used by the reasoning model for analysis.

Due to the limitation that it is not possible to read the real-time ban/pick data from the user's game session, otherwise the game will detect our application as malware. User has to manually input the ban/pick selection in our UI and the system will then make recommendations accordingly.

Knowledge Acquisition & Representation

To acquire the knowledge needed for the model, the team has implemented a data crawler that crawls the data from a website that has the most up-to-date game data and stats

The screenshot shows the League of Graphs website interface for the champion Ahri. The left sidebar includes links for Home, Champions (selected), Overview, Champions stats, ProBuilds, Matchups, Runes, Skill Orders, Items, Summoner Spells, More..., Rankings & Stats, Infographics, Replays, and Professor. A note at the bottom indicates Patch: 10.9 and 8,620,342 matches (Last 2 days). The main content area displays Ahri's profile with her portrait and the word "Mid". Below this are tabs for OVERVIEW, STATS, PROBUILD, MATCHUPS (selected), RUNES, SKILLS, ITEMS, and SUMMONER SPELLS. A note says 27,068 matches (Last 2 days). The MATCHUPS section contains three tables:

- Ahri is best against ...**: Shows LeBlanc (+2.0%, +161 gold diff @15) and Diana (+1.6%, -182 gold diff @15).
- Ahri is countered by...**: Shows Zed (-1.6%, -519 gold diff @15) and Sylas (-1.3%, +39 gold diff @15).
- Ahri is best with ...**: Shows Ivern (+9.5%), Quinn (+7.4%), Wukong (+6.3%), Singed (+6.3%), Warwick (+5.9%), and Rengar (+5.2%) all as Junglers.

A "See more" button is located at the bottom of the third table.

(Sample page used by the data crawler, source:
<https://www.leagueofgraphs.com/champions/counters/ahri>)

Take the above image as example, the data crawler will capture what is the champion best against, which champions counter him and which champions are his best teammates. These are essential data points that will be used by the reasoning model for the decision making. The data of all 148 champions will be saved in a csv file and store in the user's local machine. User can also access the file if he is interested in the data.

champion name	relationship	agent champion name	lane	win rate
nami	best against	Sett	Support	0.0288
nami	best against	Fiddlesticks	Support	0.0239
nami	best against	Veigar	Support	0.0222
nami	best against	Rakan	Support	0.0195
nami	best against	Lux	Support	0.0185
nami	best against	Senna	Support	0.0126
nami	best against	Morgana	Support	0.0107
nami	best against	Alistar	Support	0.0104
nami	best against	Karma	Support	0.0092
nami	is countered by	Blitzcrank	Support	-0.0337
nami	is countered by	Sona	Support	-0.0273
nami	is countered by	Maokai	Support	-0.0269
nami	is countered by	Zyra	Support	-0.0199
nami	is countered by	Swain	Support	-0.0172
nami	is countered by	Brand	Support	-0.0166
nami	is countered by	Xerath	Support	-0.0166
nami	is countered by	Malphite	Support	-0.0154
nami	is countered by	Zilean	Support	-0.0132
nami	is countered by	Janna	Support	-0.0122
nami	is countered by	Taric	Support	-0.0108
nami	is countered by	Leona	Support	-0.0101
nami	is countered by	Bard	Support	-0.0087999999999999
nami	is countered by	Lulu	Support	-0.0085
nami	is countered by	Nautilus	Support	-0.0077999999999999
nami	best with	Urgot	Top	0.0537
nami	best with	Amumu	Jungler	0.0399
nami	best with	Yorick	Top	0.038
nami	best with	Nasus	Top	0.0364
nami	best with	Diana	Mid	0.0364
nami	best with	Wukong	Jungler	0.0334

(Data collected for champion ‘nami’)

This table will store all the counter and coordinate relations and we also have another table that stores the overall information of each champion including his role and overall win rate. This table is used for the rule-based model that each role must be assigned with right champion.

In the table we are using 3 kinds of relations, one is ‘best against’ which is how much this champion counter the ‘agent champion’. Similarly, we also have ‘is countered by’ and ‘best with’. This is a very complex network of relations and we have more than 10 thousand data in the csv file.

champion name	url	lane	win rate
Nami	https://www.leagueofgraphs.com/champions/counters/nami/silver/sr-ranked	Support	0.5375
Wukong	https://www.leagueofgraphs.com/champions/counters/monkeyking/silver/sr-ranked	Jungler;Top	0.5328
Urgot	https://www.leagueofgraphs.com/champions/counters/urgot/silver/sr-ranked	Top	0.5299
Taric	https://www.leagueofgraphs.com/champions/counters/taric/silver/sr-ranked	Support	0.5276
Maokai	https://www.leagueofgraphs.com/champions/counters/maokai/silver/sr-ranked	Top;Support	0.5275
Amumu	https://www.leagueofgraphs.com/champions/counters/amumu/silver/sr-ranked	Jungler	0.5252
Janna	https://www.leagueofgraphs.com/champions/counters/janna/silver/sr-ranked	Support	0.5230
Warwick	https://www.leagueofgraphs.com/champions/counters/warwick/silver/sr-ranked	Jungler	0.5224
Shyvana	https://www.leagueofgraphs.com/champions/counters/shyvana/silver/sr-ranked	Jungler	0.5221
Kled	https://www.leagueofgraphs.com/champions/counters/kled/silver/sr-ranked	Top	0.5214
Diana	https://www.leagueofgraphs.com/champions/counters/diana/silver/sr-ranked	Mid	0.5208
Nasus	https://www.leagueofgraphs.com/champions/counters/nasus/silver/sr-ranked	Top	0.5206
Yorick	https://www.leagueofgraphs.com/champions/counters/yorick/silver/sr-ranked	Top	0.5203
Trundle	https://www.leagueofgraphs.com/champions/counters/trundle/silver/sr-ranked	Jungler	0.5202
Sona	https://www.leagueofgraphs.com/champions/counters/sona/silver/sr-ranked	Support	0.5197
Swain	https://www.leagueofgraphs.com/champions/counters/swain/silver/sr-ranked	Support	0.5192
Volibear	https://www.leagueofgraphs.com/champions/counters/volibear/silver/sr-ranked	Jungler;Top	0.5192

(Role and win rate information for each champion)

Dynamic Rule-Based Model

The recommendation is given by a weight value that will be updated dynamically after each ban and pick, and the weight maintenance is rules are as follow:

Parameter	Rules
W	Statistical win rate of the champion
A	Statistical win rate increase with teammate champions
C	Sum of win rate decrease with countering enemy champions, and win rate increase with countered enemy champions
Weight	$W + A + C$

(weight maintenance rule for picking recommendation)

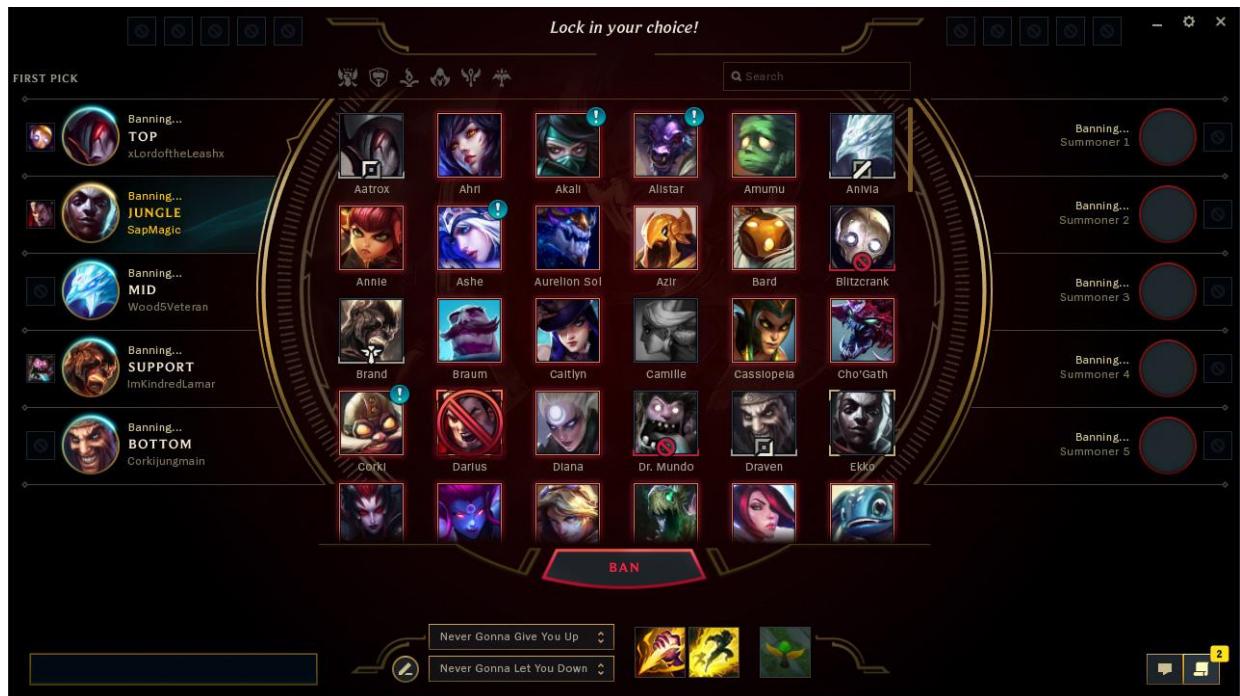
Parameter	Rules
B	Statistical ban rate of the champion
E	Win rate increase with enemy banned champions
A	Win rate increase with enemy champions
C	Sum of win rate increase with countering our champions, and win rate decrease with countered our champions
Weight	$B + E + A + C$

(weight maintenance rule for banning recommendation)

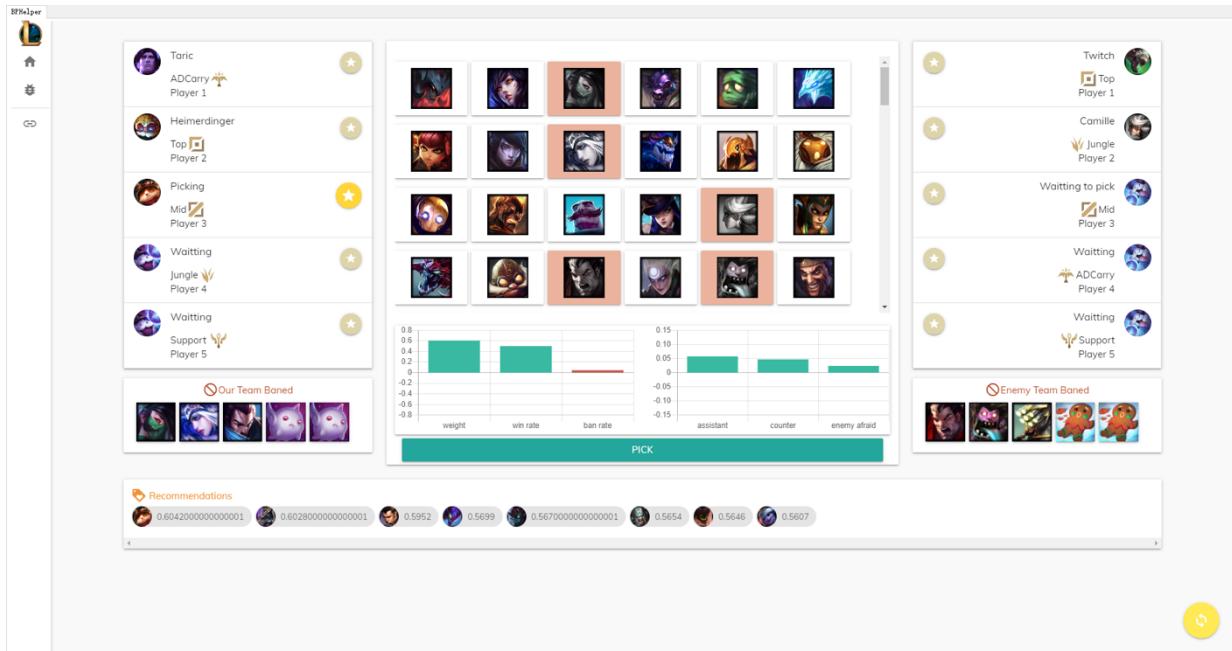
With each ban/pick input from user the values for each parameter will be updated accordingly by separate rules defined for each of them. By making our system dynamic, we can make the most accurate recommendations based on the real-time input from the user.

Ban/Pick UI

Since there only limited time for each ban/pick selection, to give our user the best experience, our team made the ban/pick UI similar to the actual game ban/pick UI so it is more intuitive to the users. This will save more time for the user to look and the suggestions and pick the ones that he finds more confident with or ban the ones that he fears the most.



(Actual in-game ban/pick UI)



(Our system UI)

Project Validation/Feedback

To prove that our system actually helps the player to come up with better ban/pick decisions, we invited 5 of our friends who play League of Legends and are at same rank level. We asked them to use our tool for the ban/pick and played one game, and then we asked for their feedback.

They won the game eventually and here are some of the feedbacks from them:

'It's great tool, I don't have to think a lot when ban/pick and most of suggestions are same as my own understanding and experience. But I think some of the unpopular champions are also been suggested but not really a lot of people play them, maybe you can try to ignore those?'

'It is very cool, I like it, but I only know how to play few champions so most of the pick suggestions actually do not work out very well for me, but my team did a great job.'

Project Conclusion

There are certainly some limitations in our product, as mentioned in the feedback that the tool cannot cover player's playstyle like which champions the player are comfortable with. There is a lot of room for improvement, but our team had tried our best to deliver whatever we can within this limited period using the knowledge we learnt from the course. We believe our system is already adequate enough to help players to have a better gaming experience based on the feedbacks from our friends and it will be a big hit if we launch it to the market.

Appendix

Project proposal

Please refer to

https://github.com/tzsydym/ISS_MR_RS_BHelper/blob/master/ProjectReport/IRS-PM-PROPOSAL-2020-05-01-LOL-Smart-Ban-Pick Assistant.docx

Mapped System Functionalities

Data crawler: idea from Cognitive System Day1 ‘AirTrafficSolution.py’ provided by instructor

Data format: knowledge acquisition and representation from Machine Reasoning

Algorithm for making recommendation for the ban/pick: knowledge driven rule/process based reasoning system from Machine Reasoning and hybrid reasoning system (user’s decision will update the weight maintenance) Reasoning System

Installation & User Guide

For full detailed guide with image reference please refer to

https://github.com/tzsydym/ISS_MR_RS_BHelper/blob/master/ProjectReport/Installation%20and%20User%20Guide.pdf

1. In a Windows PC, download the ‘debug.zip’ file from https://github.com/tzsydym/ISS_MR_RS_BHelper/blob/master/debug.zip
2. Unzip the file to any location.
3. To launch the application, double click on the ‘ISS_MS_RS_BpHelper’ file
4. Before using the application, please use the data crawler module to extract the data set, go the crawler page by opening the side menu
5. Click Menu > Start Crawler
6. Select region and rank based on own preference
7. Click ‘OK’ once selection done
8. Wait for the crawler to finish the job (could take a few minutes)
9. After the job finished, make sure 2 csv files are under ‘debug\crawler data(Server selected)(rank selected)’

10. Go back to the crawler page and click ‘menu again’, then click ‘Persist csv into memory’ to load the data into the application
11. Then select the server and rank from step 6/7 (or other server/rank that are available in ‘debug\crawler data’ directory)
12. Now we are ready to use the ban/pick assistant, go to side menu and click ‘Home’
13. Click ‘start new game’ button at the bottom right corner to start a ban/pick session
14. The left side is our team’s ban/pick and the right side is enemy team, the flick symbol means who’s turn to ban/pick.
15. Now go ahead and play with our tool and see what happened, the chart will be updated dynamically for each selection to show the relation values, you can make your ban/pick selection by clicking the button under the chart

Individual Project Report

Please refer to project member’s individual project report from

https://github.com/tzsydym/ISS_MR_RS_BHelper/tree/master/ProjectReport