DATA 556 - Visualization concept documentation

League of Legends (Visual Exploratory Tool)

Executive Summary

League of Legends (also known as LoL) is a multiplayer online battle arena game (MOBA) developed by Riot games. The game was first released in 2009 and has been growing in popularity ever since, becoming one of the highest grossing MOBA games in the world(1). The basic premise of the game is to destroy the opponent team's nexus - a protected structure located within the enemy's base. Summoner's rift is the most commonly played game mode where 2 teams of 5 players (each playing a unique champion -game character) battle against each other. Given the strategic nature of the battle play, choosing the right champion who plays to the player's strengths gives one team a competitive edge over the other.

Our visualization dashboard attempts to serve as an exploratory tool for the players regardless of their level, where they use our tool to get an overview of the champions and top champions by each role, get in depth details that includes but not limited to top allies, top counters, top spells etc. and also do a head to head comparison. Thus, our visualization tool provides a narrative for a champion that a player chooses to explore, giving insights into the rank of the champion among all champions as well as their unique strengths and attributes. The tool currently has two states, i) the landing page that gives an overview of champions through a scatter plot that encodes 3 features, bar chart that represents the popularity and top 3 attributes encoded as images with their corresponding stats when a champion is selected. This effectively follows Schneiderman's visual mantra. ii) An in-depth head to head comparison of two selected champions that helps the player with the champion's abilities through a radar chart, their win rate distribution through line and bar charts and all the key attributes encoded as images.

The team was effectively able to achieve these states by leveraging the concepts learnt during the course of the class and the dashboard is in line with the design prototype. It was a challenging project where the learning curve was steep in terms of both the data processing and the visualization and end-result was certainly rewarding. Due to the complexity and the dynamic nature of the team recommendation that was originally designed as the final state, in the given time, the team could not implement it and so it will be taken up as a future addition to the project.

Concept Background

Introduction

League of Legends is a 5v5 online MOBA game created and published by Riot Games. The end-game objective of the game is to destroy the enemy team's nexus, located deep into their base. Before doing so, players split into roles and head into lanes where they must battle enemy players and destroy their structures. Players choose champions in order to play the game, with all champions having unique abilities and roles. Choosing the best champion depends on several factors such as which champion best counters the opponents' picks and go well with your team, champion's stats in the current patch, etc. The concept for our visualization was to leverage the

in-game statistics to help users gain a better understanding of the champions in the latest patch enabling them to draft the best champions and improve their win rates.

Research of Topic (Previous work)

Existing websites

There are several websites that shows different statistics of League of Legends match data. However, we tried to have visualizations that differentiate from these websites.

[op.gg]
Op.gg is one of the most widely used statistics websites for League of Legends match data. However, op.gg focuses on specific **users'** statistics, instead of **champions'** statistics. If a user searches another user by in-game name in op.gg website, the website shows which champions that specific user plays the most and give statistics on how good a user is on specific champion. On the other hand, our visualization is not specific to a user's statistics. Rather, we focus on the overall champion's statistics that can be applied to any user.

[https://lolcounter.com/]
Lolcounter is another statistics website for League of Legends which focuses on counterpicks on specific champion. Although our visualizations have a similar top 3 counters section, we tried to differentiate by showing the actual statistics as a win rate, as well as providing multiple other attributes of each champion, and showing champion-vs-champion statistics comparison.

Differentiation

Most of the online available statistics websites for League of Legends focuses on player's statistics. Only a few of the websites provide in-depth information on champion stats. The complexity of the game arises from the fact that every champion serves a specific role and has a unique playstyle, strengths and weakness which become evident when compared to other champions. We wish to bridge this gap through our visualization by providing champion-vs-champion stats comparison along with top recommended items, allies and counters for the latest patch.

Goals and target users

- Goals
  - Give informative statistics for different champions to League of Legends users based on current patch.
  - Provide users the ability to compare champion stats and their win rate by game duration to help them understand the most optimum playstyle for the champions against each other.
  - Help League of Legends users to improve their win rate in the ranked games.
    - By helping the drafting - bans, champion picks. (actions)
- Target Users
  - Our primary target audience are the League of Legends players (competitive), these are people that care about their win/loss ratio and want to choose the best set of champions that maximizes their chance of winning.

- Beginners and casual LOL players will also benefit from the presented visualization as it could help them to quickly figure out and learn the playstyles for popular champions.

Data Processing

- Data source
  - League of Legends is developed by Riot Games, and Riot Games officially provide developer APIs to give access to various game-related resources. These APIs give information about specific matches, players, champions, masteries, tournaments, etc. However, we are specifically interested in the matches API because we are focusing on the statistics of these matches. As a result, we decided to collect the matches data by periodically calling matches API to the Riot Games API server.
  - There are some other static attributes like champions, items, runes, and their images which can be downloaded from the official developer website.
- Data exploration
  - Using a sample API response and reading the official API documentation, we decided to collect around 142 features among 158 different features. This is because some features were duplicates, and some features weren't really relevant for our analysis.
- Data acquisition
  - We wrote our own Python script to keep fetching new matches data from the Riot Games API server. In order to keep fetching new matches, we had to call another API that returns a list of matches for a specific user. Since one match data gives information about nine other users, we added those users into the queue to fetch new list of matches and collected more matches that are included in the new list of matches.
  - Since this graph search style algorithm can be biased to the root match (or root user), we used different root node to search list of matches.
  - Finally, we collected the match data and aggregated into one single file while removing the duplicates. (The uniqueness of each match could be determined by the gameID field). Before removing duplicates, we had 1,305,010 rows of matches data.
- Data Cleaning
  - The API response of the matches API returns JSON object. Therefore, in order to analyze this match data object as a tabular format, we had to flatten the JSON into a csv format. During this process, we also filtered some attributes that we don't need for our analysis.
  - After fetching the dataset simultaneously, we aggregated multiple csv files into a single csv file. During this process, we removed some duplicates in the csv file, and filtered only 9.22 patch version data. Finally, we ended up with 431,600 rows of matches data.
- Data computing
  - Since users are more interested in the statistics, especially the win rate, of the matches, we have to compute relevant statistics that has high demand of the user. We calculated win rate, ban rate, pick rate, pick-ban rate, top 3 items, top 3 runes, top 3 spells, win rate over game duration, top 3 ally champions, and top 3 counter champions based on the 431,600 rows of matches data. We tried using Tableau Prep using a few samples, however, even with the samples, the data was too big, so the program slowed down. In addition, since we wanted to use all of the data,

not just samples, we decided to use custom Python script to calculate the statistics for each champion.

- Data versioning
    - During our process, we frequently updated our original match data, and our calculated (derived) statistics data from the original match data. This was due to new or updated dataset or fixed a bug in the calculation script.
    - In order to communicate more effectively as a team, we named the original match dataset with suffix “V0”, “V1”, “V2”, and so forth. In addition, for the derived statistics data, we put the same suffix to indicate which original match dataset it was calculated from.

Design Process

Usability Tests

We randomly chose 3 students who were playing League of Legends at the Odegaard Library, show them the paper prototype and let them do the usability tests. Users were asked to finish several tasks and challenges without our guidance, we recorded and rate their performance based on the total time and guidance they need from 1 to 5.

Below are the detailed rating criteria:

5: Prototype is very intuitive and easy to understand

4: Model was relatively straight forward but participant was confused about one or two aspects.

3: The participant had few questions about what he/she was supposed to do at one or two steps in the process.

2: The participant was not able to do multiple (3+) steps but was able to complete with some guidance.

1: The participant was totally confused about the prototype and asked multiple questions about what things were and what they should do (became confused 5+ times and had more than 5 questions about the prototype)

And following were the three major tasks.

Task1: Must be able to navigate through the first screen by choosing a filter for their lane.

Task2: Must be able to select their champion, and the champion they want to compare their stats against then understand the radar visualization.

Task3: Select multiple champions that they want to ban from play, select the champions that they want on their team, analyze the results of the radar graph and the win-rate bar graph.

After going through the whole visualization with the user, we asked them to finish 3 challenges again to check if the visualization is intuitive to understand and interact with if we explain all the buttons and functionalities to them.

C1: Can you identify the win-rate of the second best champion in the support role?

C2: Can you change the selected champions to compare their win-rates?

C3: Which team has higher expected win rate based on the champions you choose and ban?

C4: Can you change the selected champion and see how it affects the win-probability for your team?

Test results discussion

User 1 (usability score: 4) is a casual LOL gamer. He seemed not interested in the general information on champions we presented in the first page and directly jumped to the second page. He understood the charts and the goal of the visualization immediately, and said the radar chart was intuitive and helpful to compare two champions. It took him some time to figure out the buttons for filtering specific lanes but after we gave him some hints he could complete the tasks quickly. And we believe that this is mostly due to our paper prototype, if we had an actual interactive visualization, he shouldn't have spent too much time on figuring out the buttons. Due to the busy schedule, the user had to leave abruptly so we did not have time to finish the other challenges.

User 2 (usability score: 1) is a beginner and he failed to understand the goal of our interview, thinking that we were only building a paper project. He needed us to explain multiple aspects of the visualization and he didn't know what to do next even after we explained the buttons and the major goal of each page. He was not able to complete task 2 and 3, he wasn't able to identify the team with the higher expected win rate without our help.

User 3 (usability score: 5) is an advanced LOL player. He was very interested in our project, saying that "current tools can only compare two champions in the same role." He was able to finish all the tasks quickly but he was also curious about the technology and math behind the concept, worried about the run-time and implementation of it.

Usability test results summary

Pros:

1. All the plots (scatter plot, radar chart...) are intuitive and easy to understand, although different user has specific preference.

- The first user especially liked the information presented in the draft simulator and was impressed with the idea of radar charts displaying the team composition
- The third user liked the one vs. one champion comparison page and mentioned that the idea of 1 vs 1 comparison is something unique and will be useful in understanding counter champions and items

2. Our visualization allows comparison across different role or lanes while current website can only compare champion in the same role.

Cons:

1. Users seemed to not realize that the scatter plot and bar chart in the first page are connected. They focused more on the scatter plot when given a task.
2. Toggle buttons in the second page did not make a lot of sense to users as it was hiding the information, so all users needed our assistance in getting to the win rate comparison chart.

Final Design Usability tests

The final design was posted online via tableau public, the link to the visualization was sent to multiple League of Legends players along with an evaluation survey. The evaluation survey was created using google forms.

The questions that were included in the google survey are:

1. What would you rate the tool regarding usability? 1-5 (Unusable - Very Useful)
2. What's your rank?

3. How often do you play a week?
4. Who are the top 3 most popular champions for the Jungle lane?
5. Can you identify the second highest win-rate in the support role?
6. Which champion has the highest win-rate at 0-20 minutes?

The survey results included 6 responses from multiple League of Legends players. For the first question 66.7% of the responses said the tool was a 3, 16.7% said 5, and 16.7% said 2. For the second question half the responses said they were platinum and the other half were gold. The third question had 66.7% of participants respond with playing more than 5 times a week, 16.7% said 1-2 times a week, and 16.7% said 3-5 days a week. The second and third questions were for us to find out the demographics of our participants. We thought that answers from heavy users that have high ranks would be more useful than answers from low ranking players that don't play often. The remaining questions were asked to assess their ability to use the tool. For the fourth and fifth and sixth questions 66.7% got the question correct.

Modifications

Modifications for the project can be categorized as happening after the Initial Idea, Prototype, and final design stages of our visualization.

Modifications after Initial Idea

Initially we had two pages, and on the first page we were going to use a tornado graph to display the win-rates of the selected champions, but we switched to using a scatter plot to display their win-rate relative to pick rate. For the second page we decided that we were going to display the top, counters, runes, allies, spells, and items for two selected champions. After we agreed on the graphs and end-goal, it was then decided that we should add a third page with team wise comparisons, since League of Legends in a 5v5 strategy game.

Modifications after Prototype

On the first page it was decided that a scatter plot on the left side, top 10 champions on the right of the scatter plot and specific champion information on the bottom would be better for processing information. For the second page, we dropped the toggle button and show the two charts directly, because the toggle hides important information and the user is interested in speed. This went along with our want to minimize the number of clicks that the user needs to perform. Next, we dropped the "role" toggle option from screen because users might want to compare champions across different roles. For the final page, we decided to have a bigger win-rate bar because that is the main thing that users are interested in for that section.

Modifications during final design

For the first screen we wanted to include more of the information that is displayed on the second screen and shifted the location of graphs. For the second screen we decided to add abilities to the page of champion statistics along with magic attack/physical attack ratios. For the screen page no modifications were made regarding the design, but we decided to add it to the list of "future goals".

After feedback for classmates

There was an overwhelming amount of positive feedback, the only suggestion someone had for us was that we should add lines to our radar graph.

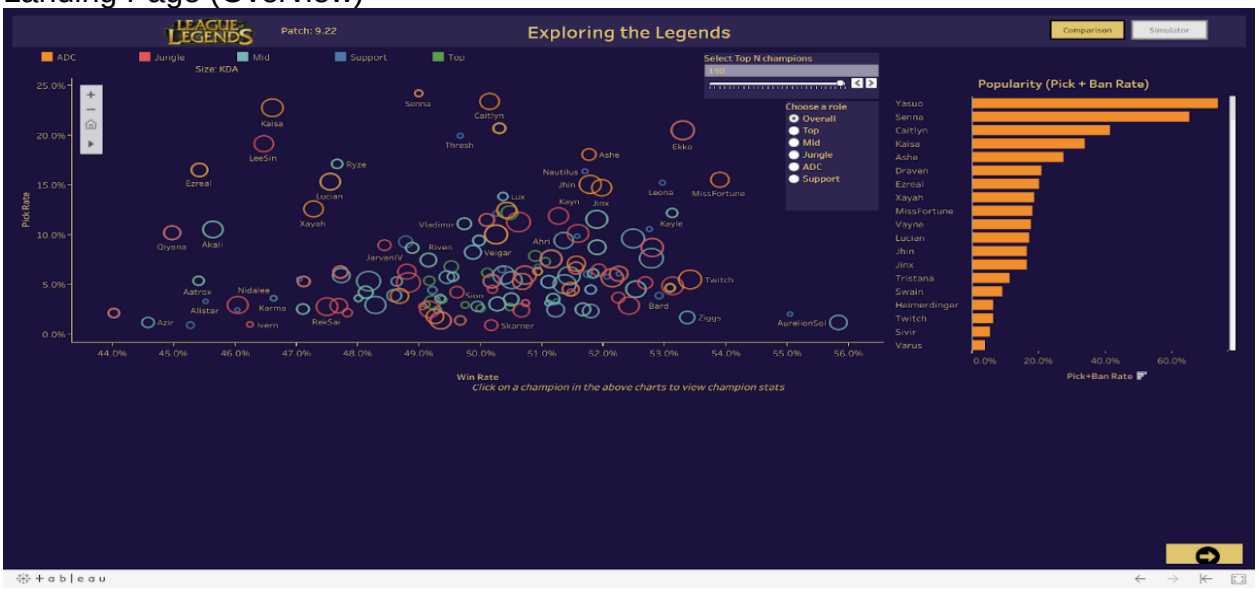
Challenges

Some of the challenges that we faced include:

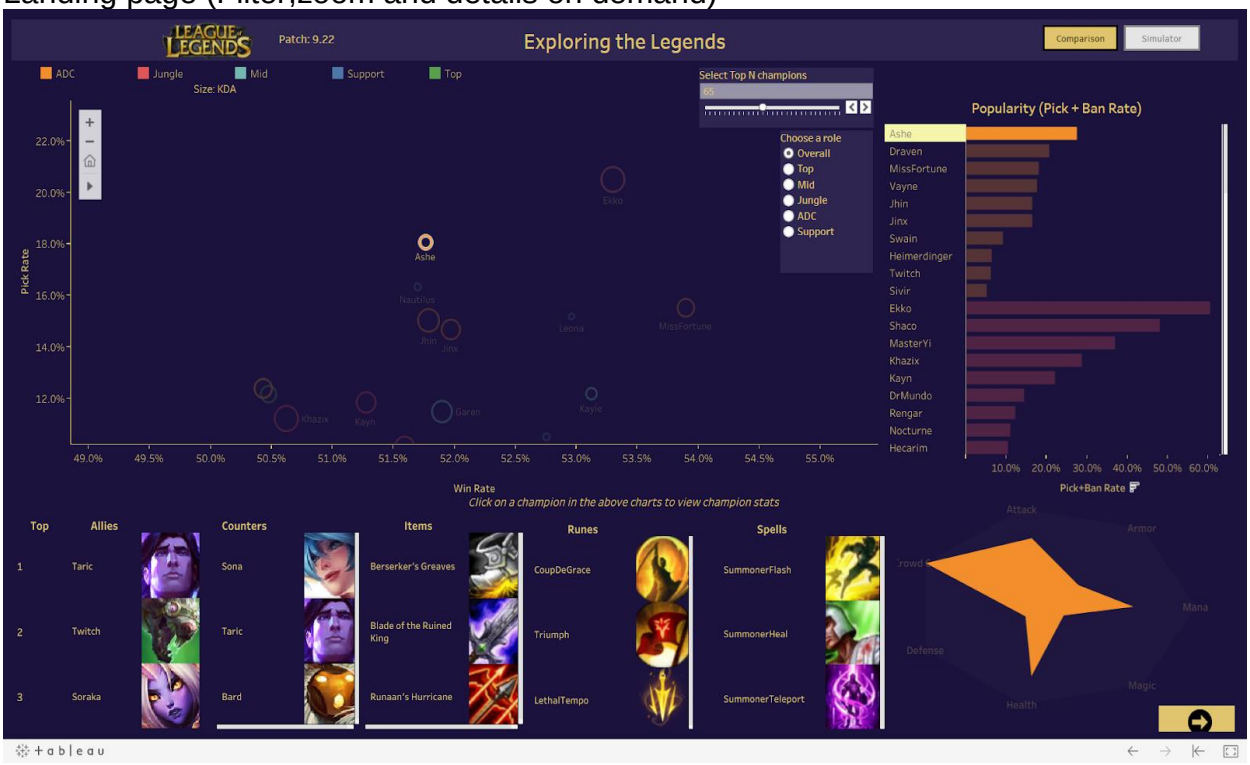
Collecting the data, deciding what information was relevant, aggregating all the files, large dataset, feature engineering, creating the radar graph, mapping images to champions, connecting information from Dashboard1 to Dashboard2. Since the data was not available in a file, we had to use Riot Games' API to pull data in json format. This required careful planning and using python to make the API requests and sleeping so we did not exceed the rate limit for requests. During the data collection process we noticed that the requests were giving us data that we did not need so we needed to decide what information was relevant for the project and discard the rest. Since only one of the team members has League of Legends experience, it took a considerable amount of time to identify what the correct columns were out of the given 180. After we ran our python script for 7-9 hours each, we then needed to aggregate the data, but this posed a challenge since some of us used different scripts to collect data. Some files that we generated were missing columns that other files had and some columns were in different languages. After we were able to successfully aggregate all the files, we were dealing with a massive amount of data which slowed down our feature engineering process, and our visualization process. Feature engineering became an issue because we knew what we wanted to have as features, but it was not immediately obvious which columns should be included in the calculations to generate the features. After some research, consultation with online forums, and Tony's intuition we were able to find the correct columns to include and generated features for each champion. These newly generated features were then appended to a separate csv file that contained information on all the champions. One of the biggest challenges we faced was created and incorporating the radar graph into tableau. Radar graphs are not a native functionality and either have to be imported or calculated with trigonometry. Besides the radar graph being difficult to implement, something that was easy to do but very tedious was mapping the different images to their respective champions. At the end of the project, we had both of the screens completed and connected but we wanted to transfer the user's selection on screen one and populate champion 1 on screen screen two.

Final Design

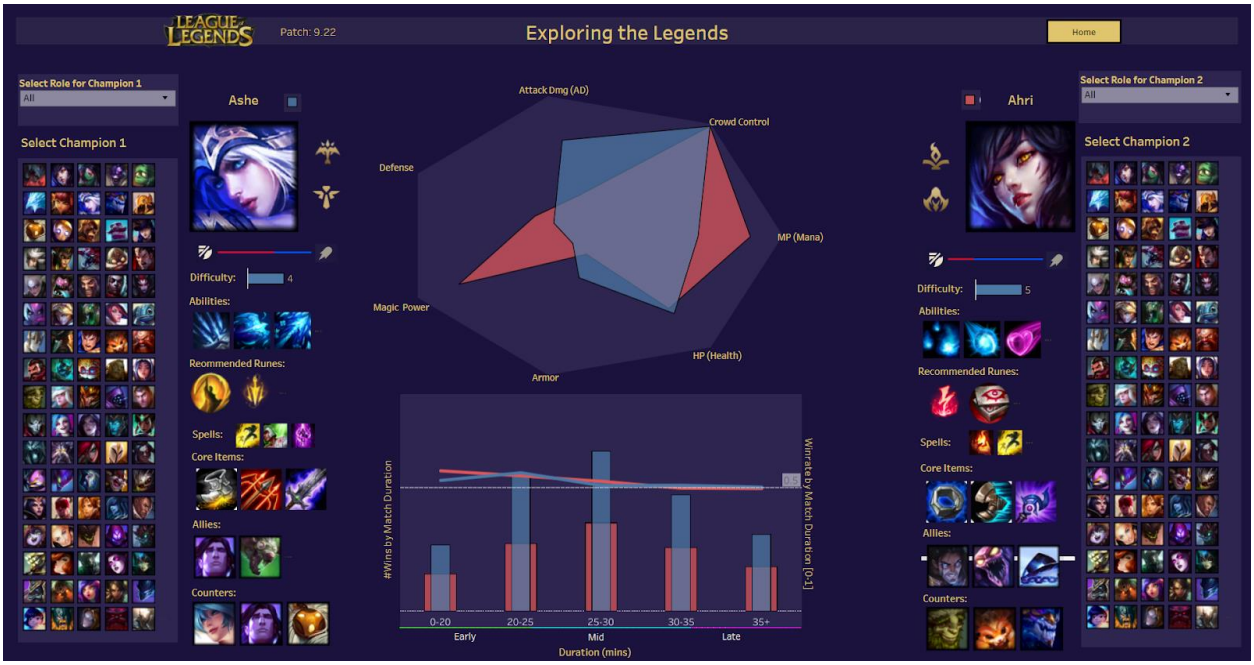
Landing Page (Overview)



Landing page (Filter,zoom and details on demand)



Head to head champion comparison (In depth details on demand)



Evaluation

After posting the link to our project online and sending the link to the survey, the main question we were interested in for evaluation was “What would you rate the tool regarding usability”. Over 80% of the participants answered that it was a 3 or above on a scale of 1 to 5 with 5 being very useful and 1 being unusable. Seeing as the majority of the participants found the tool to be general useful, we would argue that we achieved our personal goal of providing something that people actually find practical. Seeing as our goals for the project were to give informative statistics for different champions to League of Legends users, provide users the ability to compare champion stats and their win rate by game duration, and help League of Legends users to improve their win rate in the ranked games by helping the drafting - bans, champion picks, we succeeded at meeting our goals. The first page gives users statistics for every champion in the game, while the second page lets users compare champion stats and win rates. If we achieved the third goal can only be answered if we collect more data on matches played by people who used our tool. If we were able to collect a decent amount of data on people who used our tool, we would be able to see the win-rates before and after they started using it and see if they go up.

Some of the concepts/techniques from class that we used include:
Schnidermans mantra, star glyphs, and small multiples. Star Glyphs can be found on slide 14 of Week 5, “Variables encoded as distance from a center point” this was used for comparing the stats of champion one and champion 2. Small multiples can be found on slide 42 of Week 5 “Visually enforce comparisons of differences that might otherwise be obscured” we used this technique on the second page by displaying, the star glyph, the win-rate graph, and all of the feature engineered attributes for each champion. shneiderman’s mantra can be found on page 337 of the paper found here. “There are many visual design guidelines but the basic principle might be: summarized as the Visual Information Seeking Mantra: Overview first, zoom and filter, then details-on-demand”. This can be seen by our first screen, we start at an overview of all the champions then we allow the users to zoom in to get a closer look at the champions and finally if they select the champion they will be given a list of all their statistics and abilities.

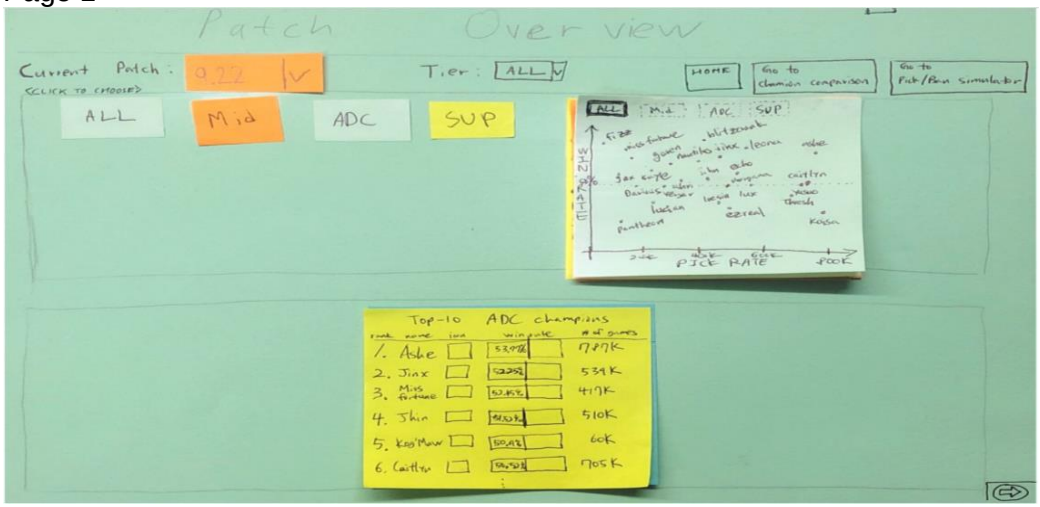
Further Work

We originally planned to do the third page which had a simulator for bans and picks for ranked games. It had visualizations for recommended champion bans, and also recommended picks for the users to play. In order to have an effective recommendation, we planned to incorporate allies champion picks and opponent champion picks for champion recommendation. However, due to the time constraint and the complexity of the task, we focused on the primary visualizations - the first and second page - which is essential to the users before understanding the third visualization.

Some of the minor features were also skipped due to the limited time constraints and the limited amount of data. For example, filtering by version was originally planned to be a dropdown menu where users can pick a specific version. However, we observed the distribution of the data to be very skewed towards the recent patches from the API with a majority of the matches belonging to patch 9.22, and some 9.23 which was the most recent version (at the time of writing). As a result, it was very hard to collect matches before 9.22 patch. However, over time, we can collect matches across multiple patches and incorporate them as multiple options from the dropdown menu. With multiple patches, we can also present plots that show different trends over patches.

Appendix (Design Sketches)

Page 1



Page 2

Page 3