League of Legends Data Report

CODECADEMY PROJECT

Introduction

League of Legends (LoL) is a 2009 multiplayer online battle arena video game developed and published by Riot Games.

In the game, two teams of five players battle in player versus player combat, each team occupying and defending their half of the map. Each of the ten players controls a character, known as a "champion", with unique abilities and differing styles of play. During a match, champions become more powerful by collecting experience points, earning gold, and purchasing items to defeat the opposing team. In the game's main mode, Summoner's Rift, a team wins by pushing through to the enemy base and destroying their "Nexus", a large structure located within.[1]

The purpose of this project is to look at the data of all the champions and break down the results in each patch, determine what champions have been the best and the worst in the current patch, and hypothesize what could happen in the next patch.

DATASET DESCRIPTIONS

- **Name:** Name of the champion
- **Class:** Fighter, Assassin, Mage, Marksman, Controller, Tank
- **Role:** Top, Mid, ADC, Support, Jungle
- **Tier:** S+, S, A, B, C, D
- **Score:** Overall score of the champion
- **Trend:** Trend of the score from champion
- **Win %:** Win rate of the champion
- **Role %:** Role rate played with the champion
- **Pick %:** Pick rate of the champion
- **Ban %:** Ban rate of the champion
- **KDA:** Kill/Death/Assist ratio of the champion (it will be (Kill + Assist) / Death) in the dataset)

[1] Description about League of Legends was created by Wikipedia

Class Descriptions[2]

- **Fighter:** Otherwise known as bruisers, fighters excel in close combat, being able to deal tons of damage and take their fair share of it as well.
- **Assassin:** Also known as slayers are, by and afar, the class with the highest damage potency and mobility in the game. They excel at accessing priority targets and killing them efficiently, along with often getting themselves out of harms' way in the process.
- **Mage:** The most noteworthy trait of a mage is that they cast spells, often requiring large mana pools in order to do so effectively over the course of a fight. Very rarely do they rely on their basic attack, instead using spells to deal damage, lock enemies down, and secure objectives.
- **Marksman:** The signature trait of a marksman is their ability to deal damage primarily through basic attacks, with abilities often existing solely to enable such.
- **Controller:** They are champions whose primary job is to assist allies in securing kills and objectives. As a result, many of the champions in this category are typically played in the support role, occasionally flexing into the middle lane when needed.
- **Tanks:** Tanks, while often lacking on the offensive front, are able to take plenty of hits and apply huge amounts of disabling crowd control effects. They excel at surviving burst damage, but often fall victim to onslaughts of consistent damage.

Role/Lane Descriptions[3]

- **Top:** The Top Laner is assigned to the top lane. They need to have high survivability, and high damage or engages.
- **Mid:** The Mid Laner is assigned to the middle lane. They need to have a high burst damage.
- **ADC (Bottom):** The ADC (aka Bottom Carry) is assigned to the bottom lane and is the most vulnerable. It's important that the champion acquires as much gold as possible to purchase key items that will greatly increase their fighting potential. They are highly dependent on item-based power spikes.
- **Support:** The Support is one of the two champions assigned to the ADC (bottom lane); their initial goal is to assist their more vulnerable teammate through the earliest stages of the game.
- **Jungle:** The Jungler is the champion assigned to the jungle. They need to be able to clear out jungle camps without too much difficulty and ambush other champions in lane.

Order of Tier and Score

TIER	SCORE
S+	72.51 – 100.00
S	57.04 – 72.50
A	47.18 – 57.03
B	40.54 – 47.17
C	34.26 – 40.53
D	0.00 – 34.25

[2] Class descriptions are from Dignitas: Classifying Classes – A Guide to Understanding Champion Classes in League of Legends

[3] Lane/Role descriptions are from League of Legends Wiki

Tasks

1. Differences in Four Patches in Season 12

    1.1. What do the Classes, Roles, and Tiers look like?
    1.2. Of all the champions, which one has the highest win?
    1.3. What is the Pick % to the Ban % for the Assassin Class?
    1.4. What are the top 10 champions based on their Score, and what does the previous trends look like?
    1.5. For the top 10 champions based on Score, what are their Win % and their Ban %?
    1.6. What proportion of champions are Marksman or Mage in Mid Role?
    1.7. What proportion of champions are Fighter or Collector, and in Top Role, have a Win % of 45% or more?

2. Champions in the Newest Patch (12.4)

    2.1. Does Lux have a higher Win % in the Mid or Support Lane?
    2.2. Of Akali's overall Pick %, which are in the Top Lane, and which are in the Mid Lane?
    2.3. What is the Pick % of Alistar compared to his Ban%?
    2.4. Of Akshan's overall Role %, what proportion is Top Role and Mid Role?
    2.5. What does Ekko have a higher KDA in, Jungle or Mid Lane?

3. Possibilities and Assumptions

Use patch 12.4 to answer these questions.

    3.1. We want to find the average KDA for all classes and compare it to the average KDA of the Tank class.
    3.2. Is there an association between the roles and classes of champions?
    3.3. In the Support Role, is it more likely for a Mage or Tank to be picked?
    3.4. We want to see what classes are better based on scores.

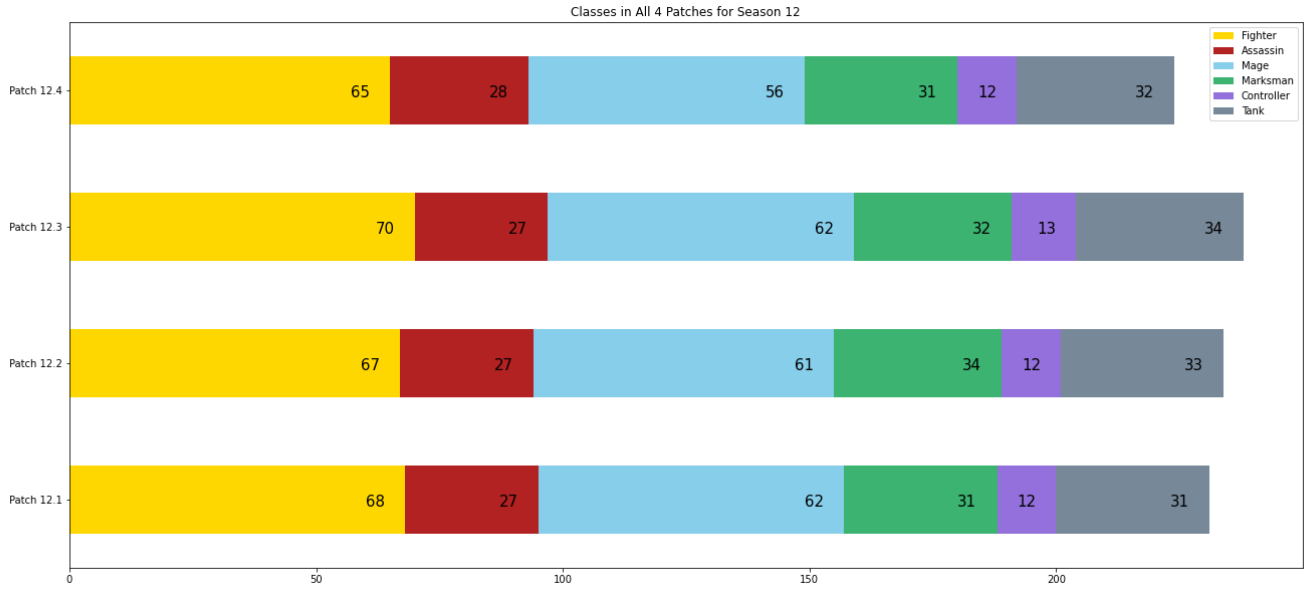
* Other than the dataset and column description[4], as well as the descriptions on the previous page, the tasks, other descriptions, and summaries are all written and created by me.

[4] Dataset patches 12.1, 12.2, and 12.3 is created by Vivo Vinco; which was retrieved from Kaggle. Dataset patch 12.4 was retrieved from MetaSrc. These datasets include all ranks.

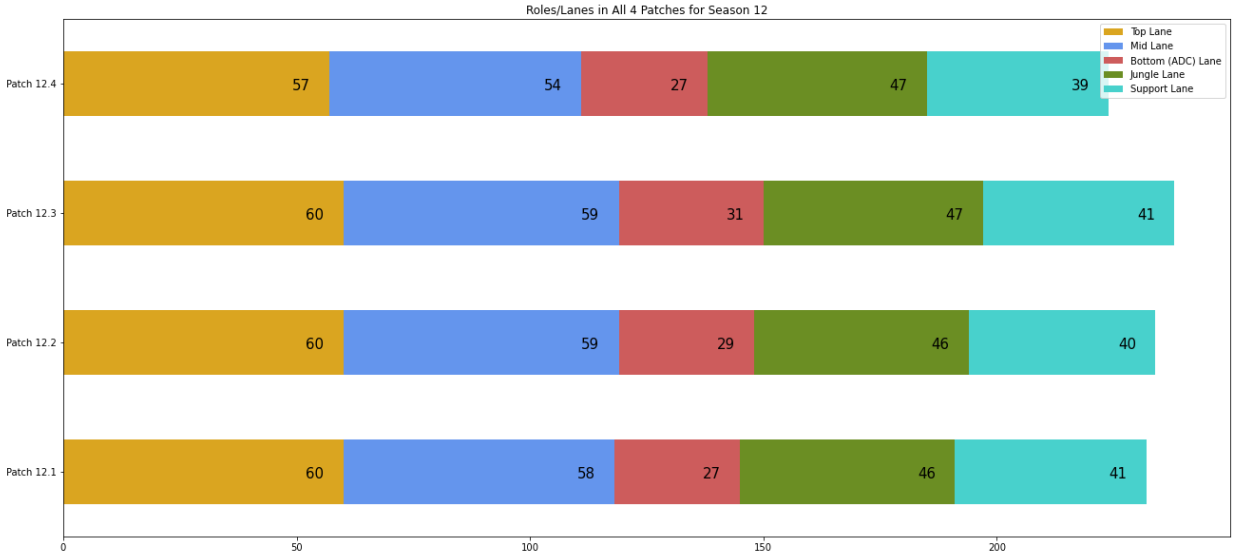
1. Differences Throughout the Four Patches in Season 12:

1.1. CLASSES, ROLES, AND TIERS

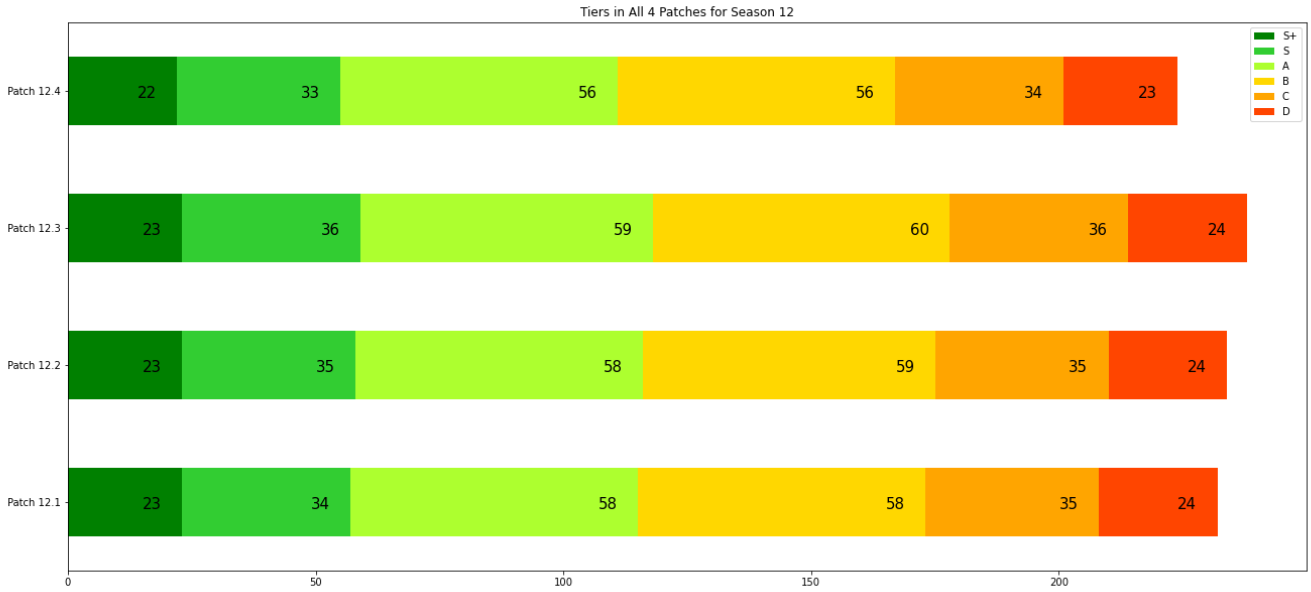
Each section is broken into the different patches, from 12.1 (the oldest) to 12.4 (the current patch). Within each stacked bar, it's broken into different classes, roles, and tiers.



With the graph above (*Classes in All 4 Patches for Season 12*), a majority of champions come from the Fighter and Mage class, and the least number of champions are Controllers. Luckily, when playing League of Legends (LoL), it is not required for every team member to be a specific class. There can be multiple classes within a team.

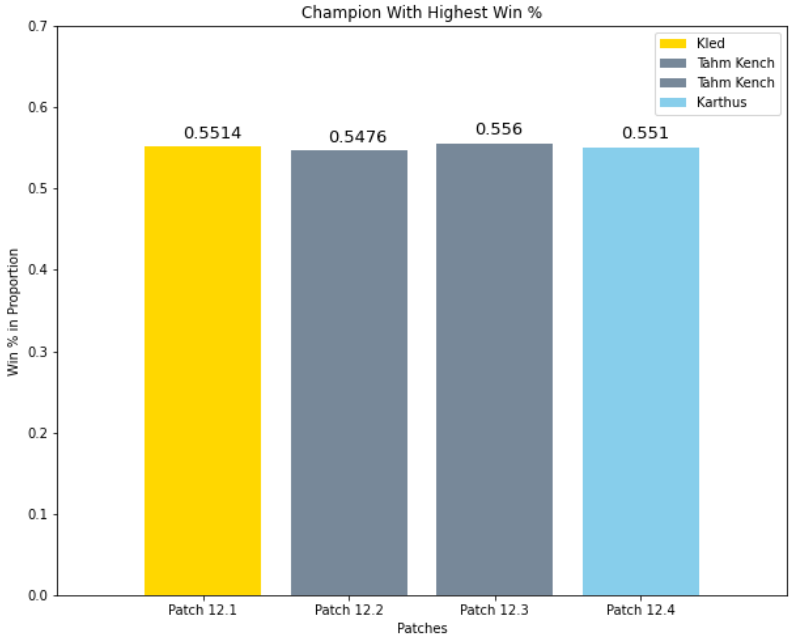


In the next graph (*Roles/Lanes in all 4 Patches for Season 12*), the Top and Mid Lanes have the most champions to choose from, then Jungle and Support as the second most, and the least number of roles is the ADC or Bottom Lane. When it comes to choosing a lane, it is required for each team member to fill each role and there cannot be multiple. This means that whoever is in the ADC Lane, they will have a limited number of champions they can use.



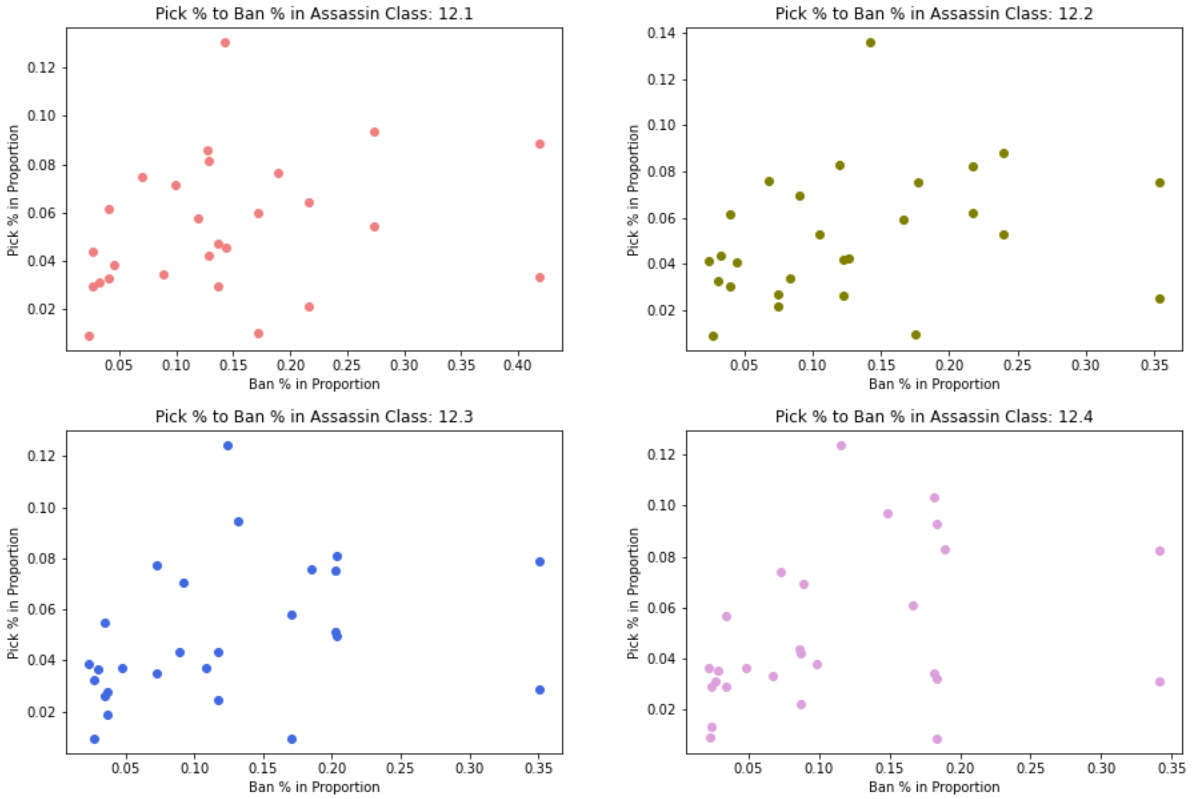
In the last graph (*Tiers in All 4 Patches for Season 12*), the top tiers: S+, S, A tend to have the equal number of champions as the bottom tiers: B, C, D. The developers intended to this for equality; essentially, they created LoL to have a 50% chance of winning, and a 50% chance of losing. It is most likely in the next patch (12.5), some of the top tier champions will become bottom tier ones, and vice versa.

1.2. WHICH CHAMPION HAS THE HIGHEST WIN%?

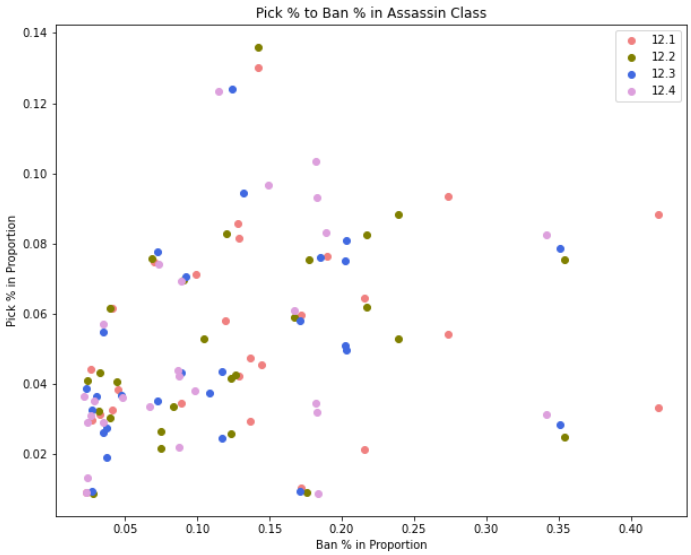


In this graph, Tahm Kench was the champion with the highest win rate for patches 12.2 and 12.3, but the champion was fixed in patch 12.4 as Karthus became the new champion with the highest win.

1.3. PICK % TO BAN % IN THE ASSASSIN CLASS?

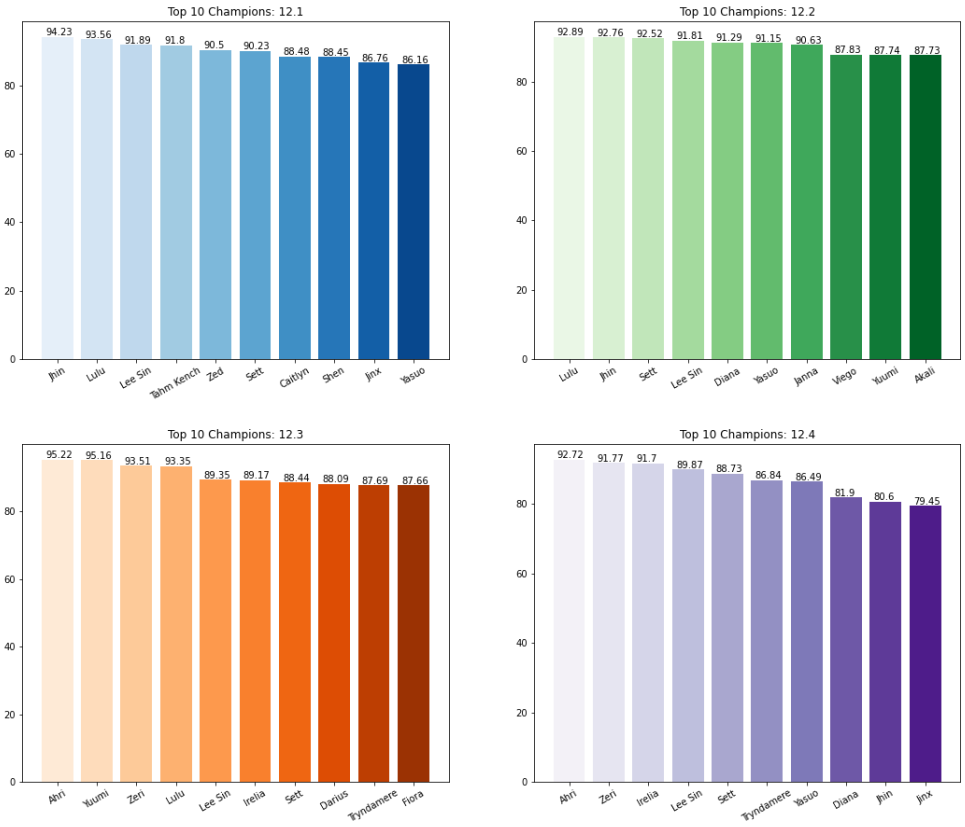


Each of the graphs in each patch looks somewhat similar to one another. There is a higher Ban % than there is a Pick % in the Assassin class. This indicates that Assassins that are rarely picked are essentially never banned, however the Assassins that have a slightly higher pick rate will most likely be banned more throughout multiple games.

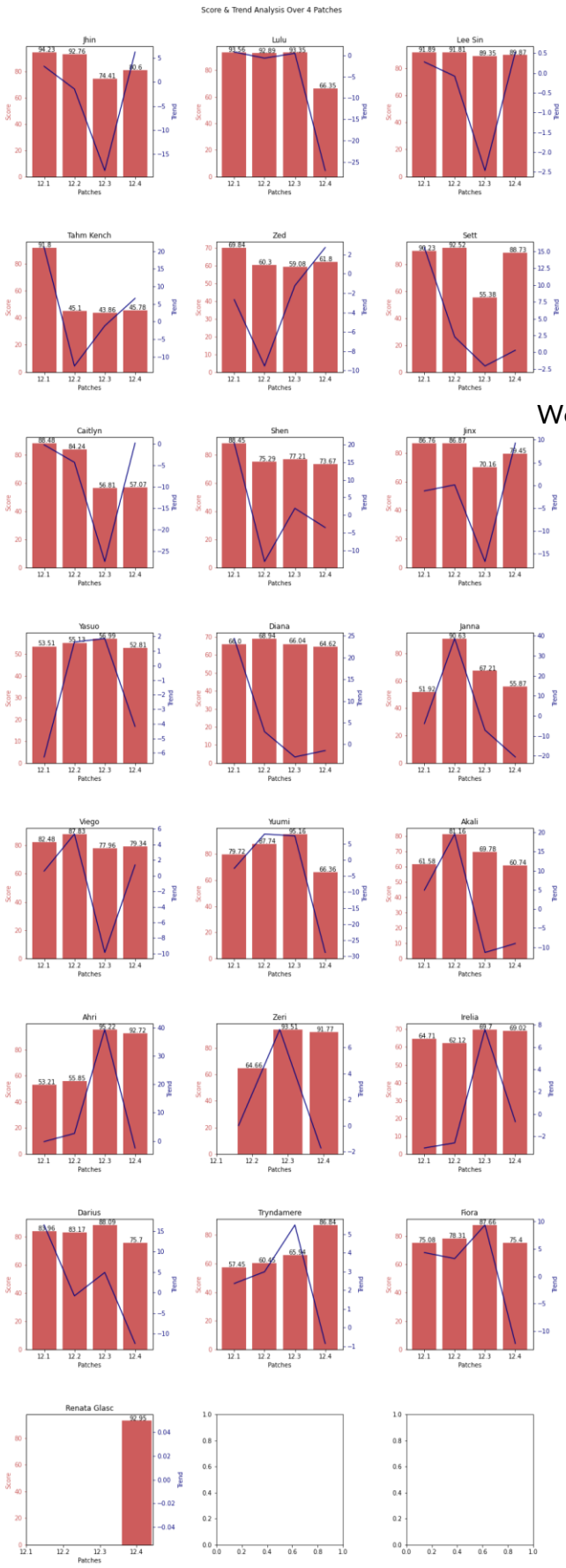


Combining all the previous four patches into one graph shows us the same result as the four patches when separate. There are many more Assassins that are banned than picked. There is also a somewhat positive correlation (r = 1) between Pick % and Ban %, but it is close to no correlation (r = 0).

1.4. TOP 10 CHAMPIONS BASED ON SCORE AND TRENDS



These are the top 10 champions based on their score in each patch of season 12. The scores are determined by the champion's Win %, KDA, Ban %, etc. that are put into a specific algorithm created by MetaSrc.



As there are a lot of graphs and data presented here, we are simply looking at the top 10 champions throughout all 4 patches, and what their scores and trends were through those patches.

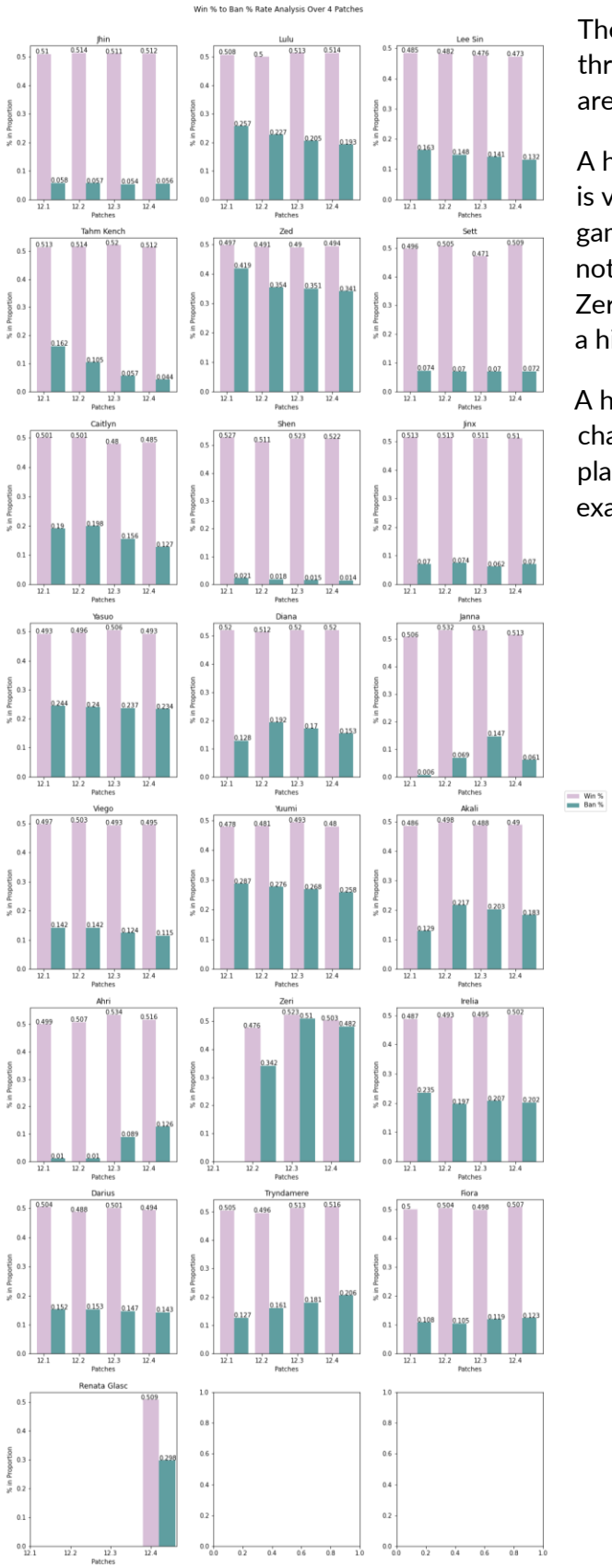
The trends seen on the graphs indicate (and predict) the overall direction of the champion's score. Most of the trends are accurate in their depictions through the patches.

We can predict that whatever trends have a downward trend for patch 12.4 will most likely go up, while the upward trends will most likely go down as the champions (especially the strong ones) will be tweaked for the next upcoming patch.

*Note: There are less champions depicted here than in the previous graph because there are duplicates, and this graph contains all the names of the champions regardless of if the champion was a duplicate.

Any champions that are missing a couple of patches means they were added into later patches.

1.5. TOP 10 CHAMPIONS BASED ON SCORE, WHAT IS WIN % AND BAN %?

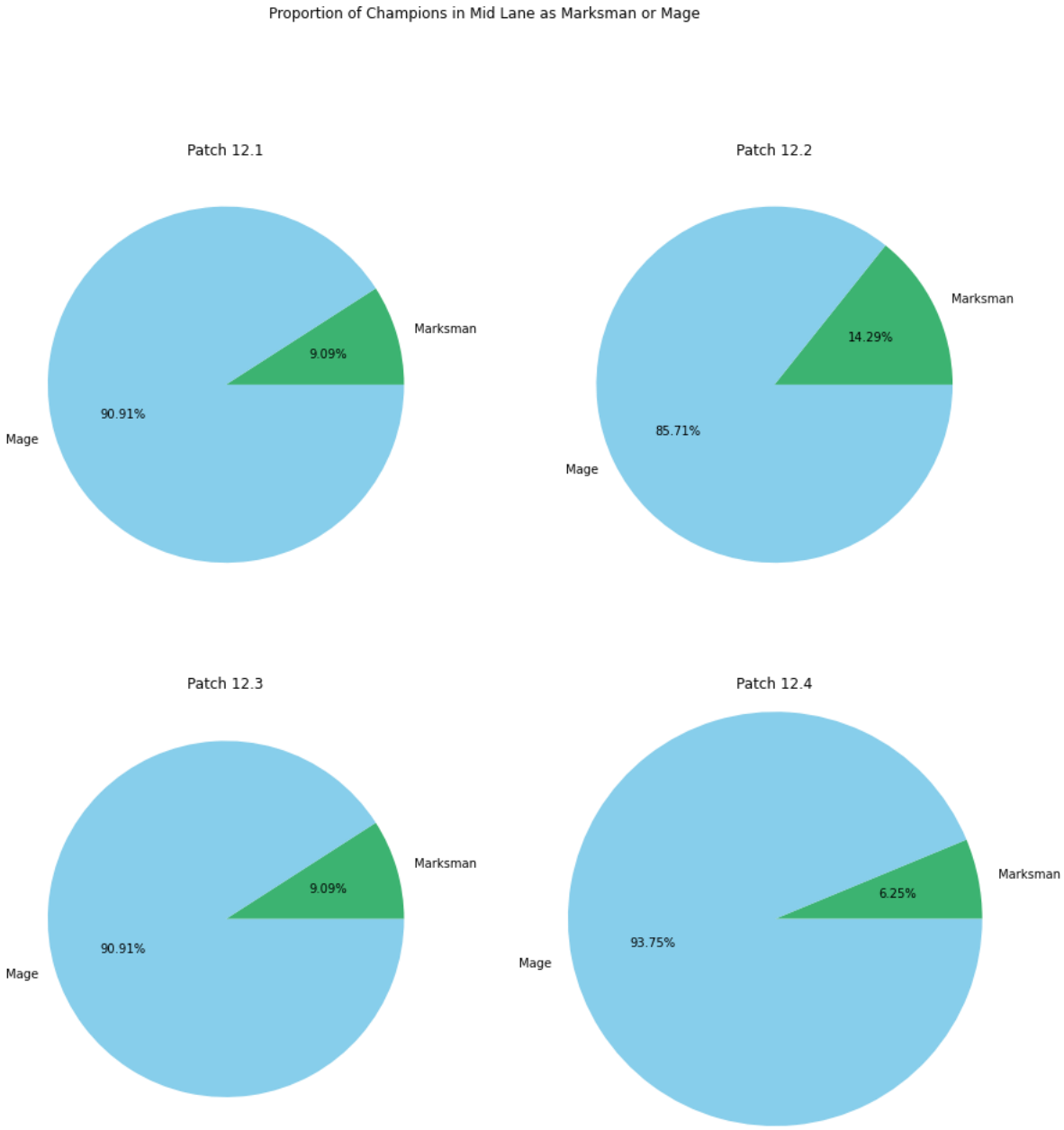


These graphs are also looking at the top 10 champions throughout all 4 patches as well; however, these graphs are the Win % to Ban % for each champion.

A high Win % and Ban % would indicate that the champion is very strong and could potentially carry and win the game, which leads to a high ban rate since many players do not want to play against these champions. Champions like Zeri, Zed, Renata Glasc, and Yuumi are examples of having a high Win % and Ban %.

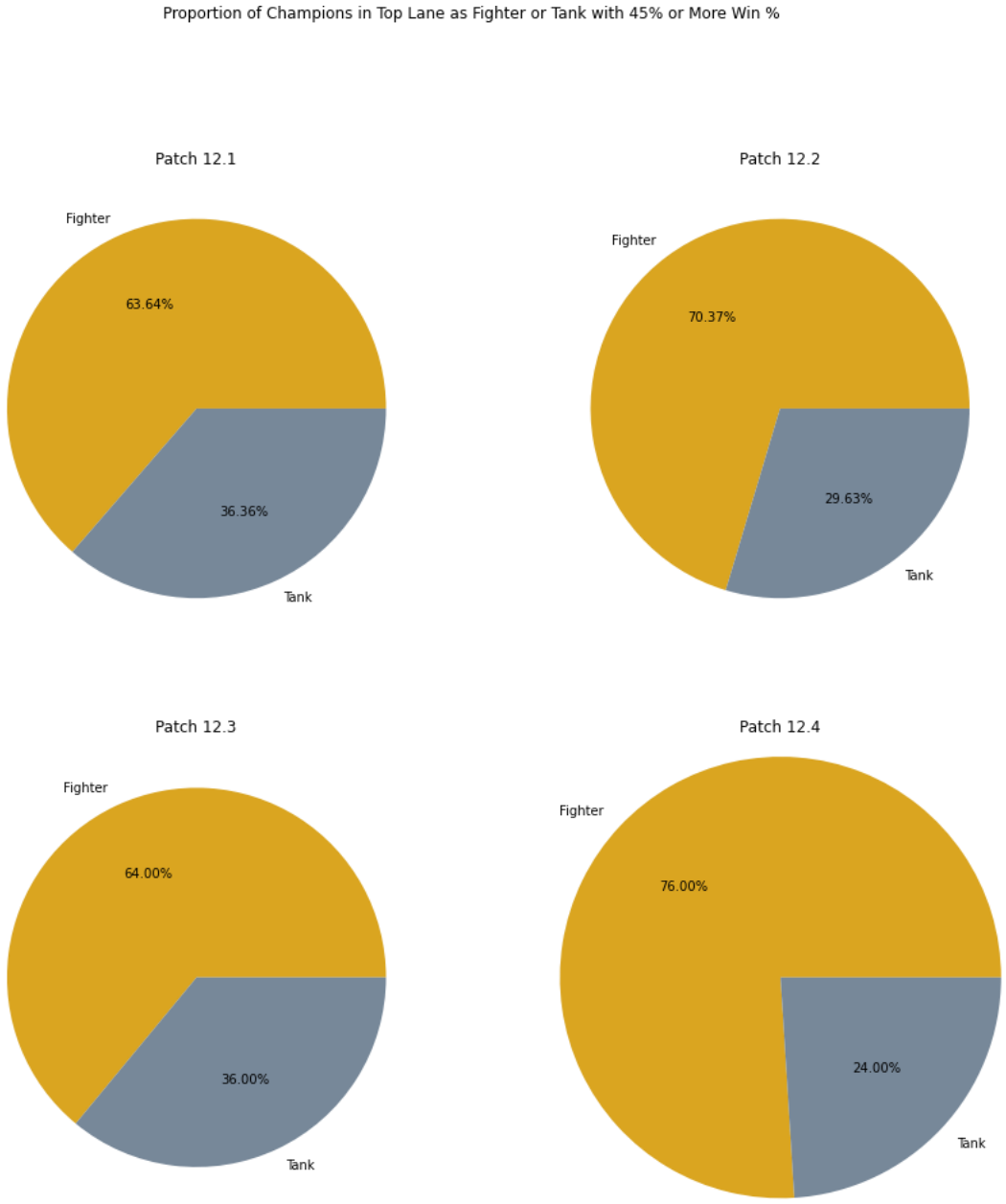
A high Win % and low Ban % would indicate that the champion is strong enough, but mostly relies more on the player's skill and ability. Jhin, Sett, Shen, and Jinx are examples of these types of champions.

1.6. PROPORTION OF CHAMPIONS IN MID LANE AS MARKSMAN OR MAGE?



In all 4 patches, there are many more Mages in the Mid Lane than there are Marksman. In patch 12.2, there was the most number of Marksman champions compared to the current patch (12.4), there are much less Marksman champions as mid laners.

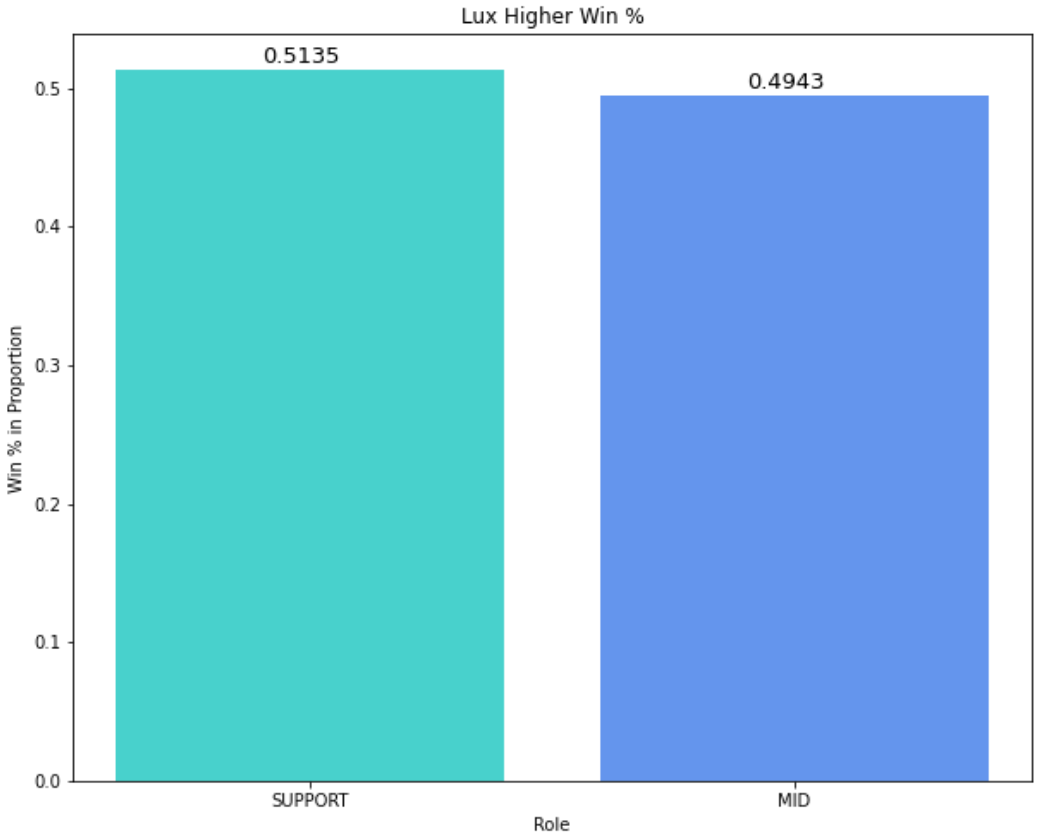
1.7. PROPORTION OF CHAMPIONS IN TOP LANE AS FIGHTER OR CONTROLLER WITH 50% OR MORE WIN %?



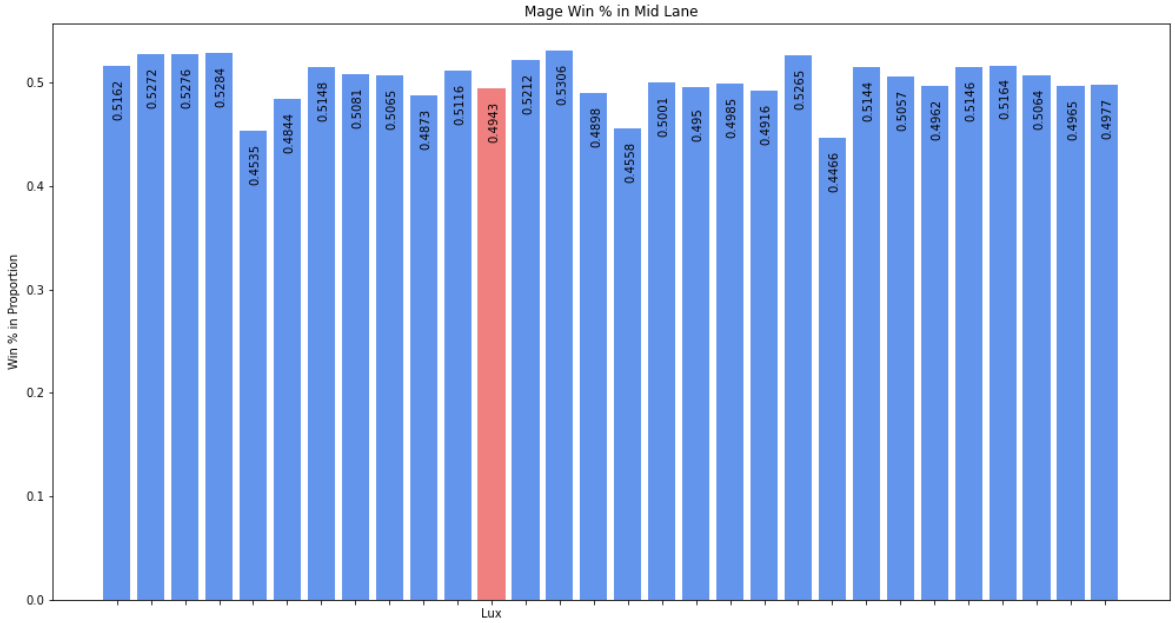
These 4 graphs show that being a Fighter in the Top Lane would have a higher Win % than a Tank would. This suggests that a player would be better off picking a Fighter over a Tank if in the Top Lane, as they would most likely have a higher advantage at winning the game.

2. Champions in the Newest Patch (12.4):

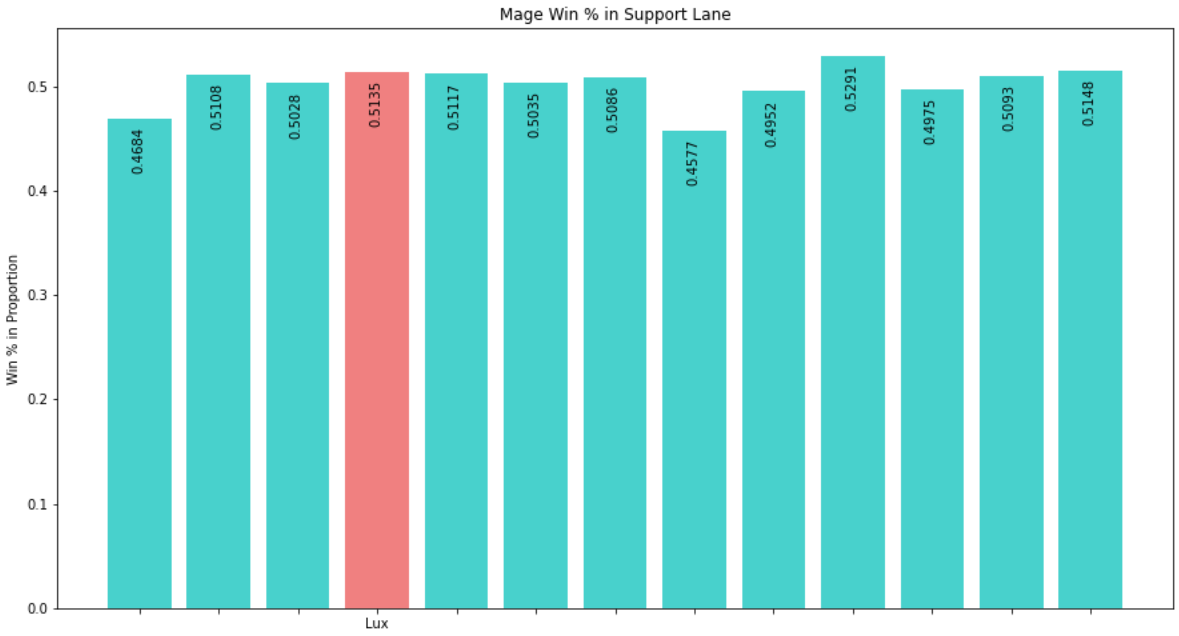
2.1. HIGHER WIN % IN MID OR SUPPORT LANE FOR LUX?



Based on Lux's Win %, a player would have a higher chance of winning a game if they chose Lux (Mage class) to be in the Support Lane over the Mid Lane. As Lux has a 51.35% of winning in the Support Lane, and 49.43% in the Mid Lane.

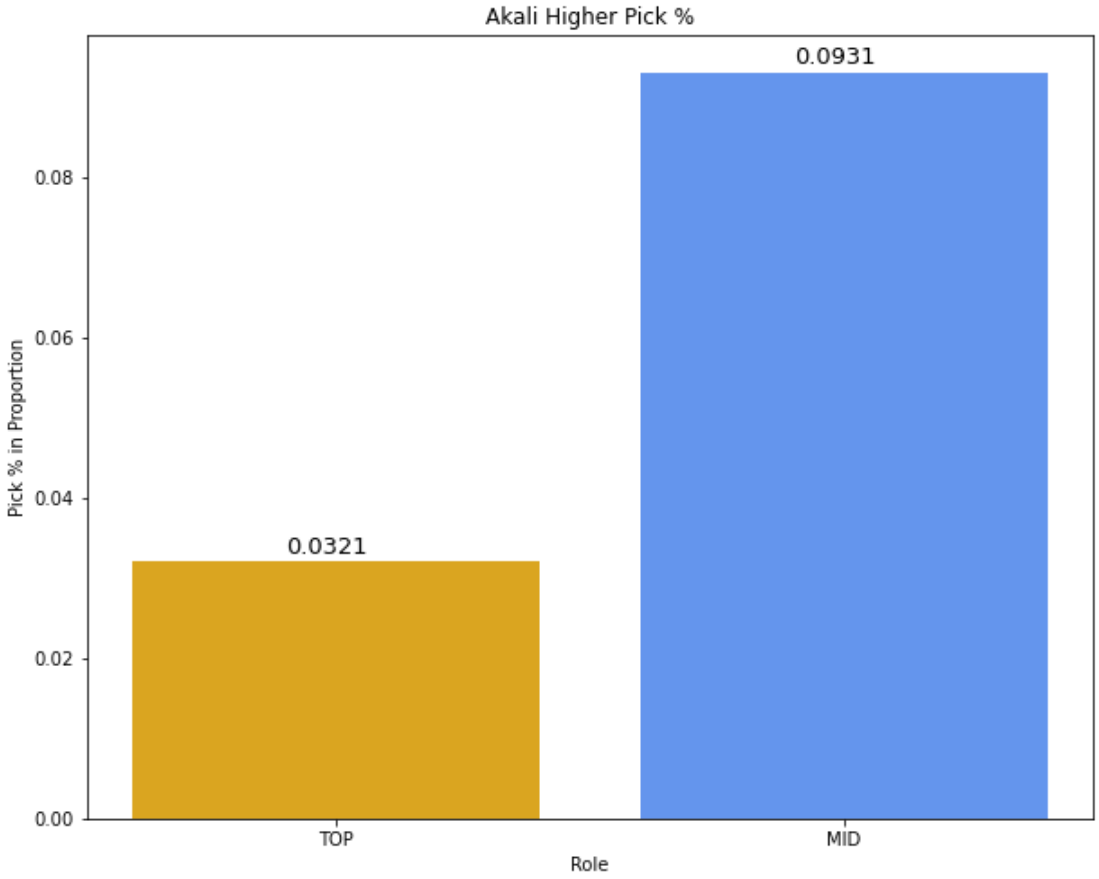


There are many Mages in the Mid Lane; about half of the champions have about a 51 – 52% win rate, and the other half has about 48 – 49%. However, in this patch (12.4), Lux has a lower win rate when in the Mid Lane.

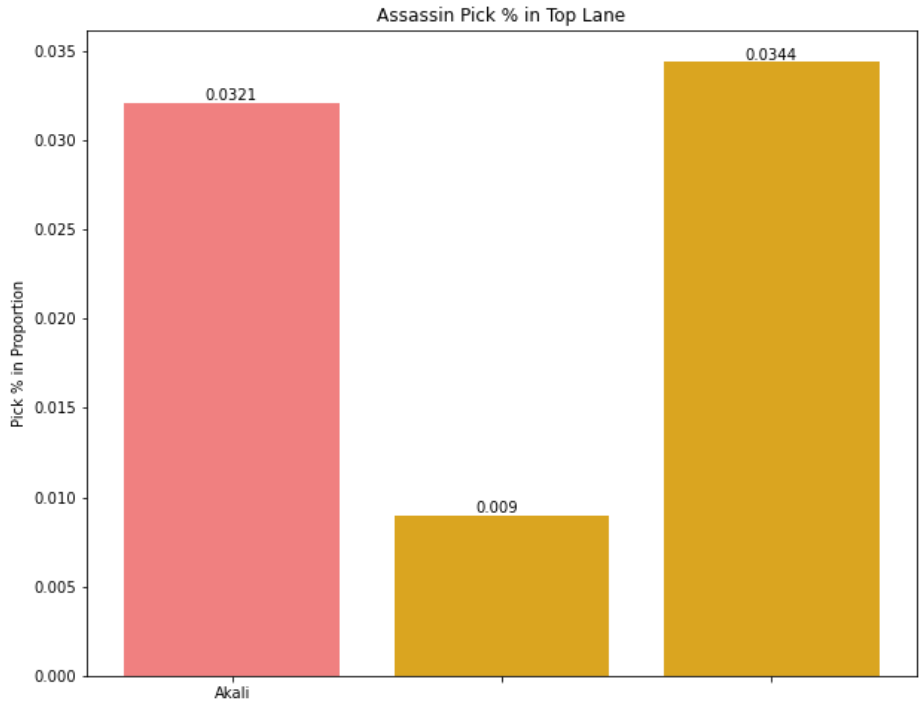


The Win % for Lux in the Support Lane is very high, as it is the top 3 of all Mages in the Support Lane. This would suggest that Lux would be a relatively good champion to be chosen.

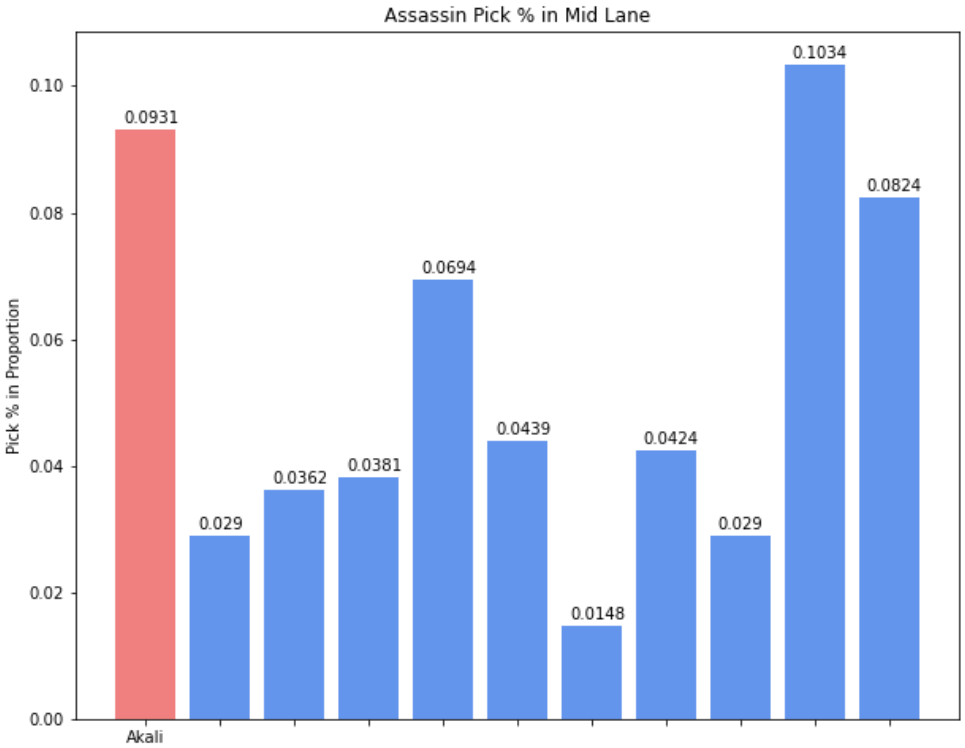
2.2. IN AKALI'S PICK %, WHICH IS IN THE TOP LANE, AND WHICH IN MID LANE?



Looking at Akali's Pick % by Role/Lane, Akali is chosen a lot more as a Mid Lane champion at 9.3%, than a Top Lane champion at 3.2%; however, remember that the pick rate numbers on this graph are actually very low compared to the other champions in other classes and lanes.

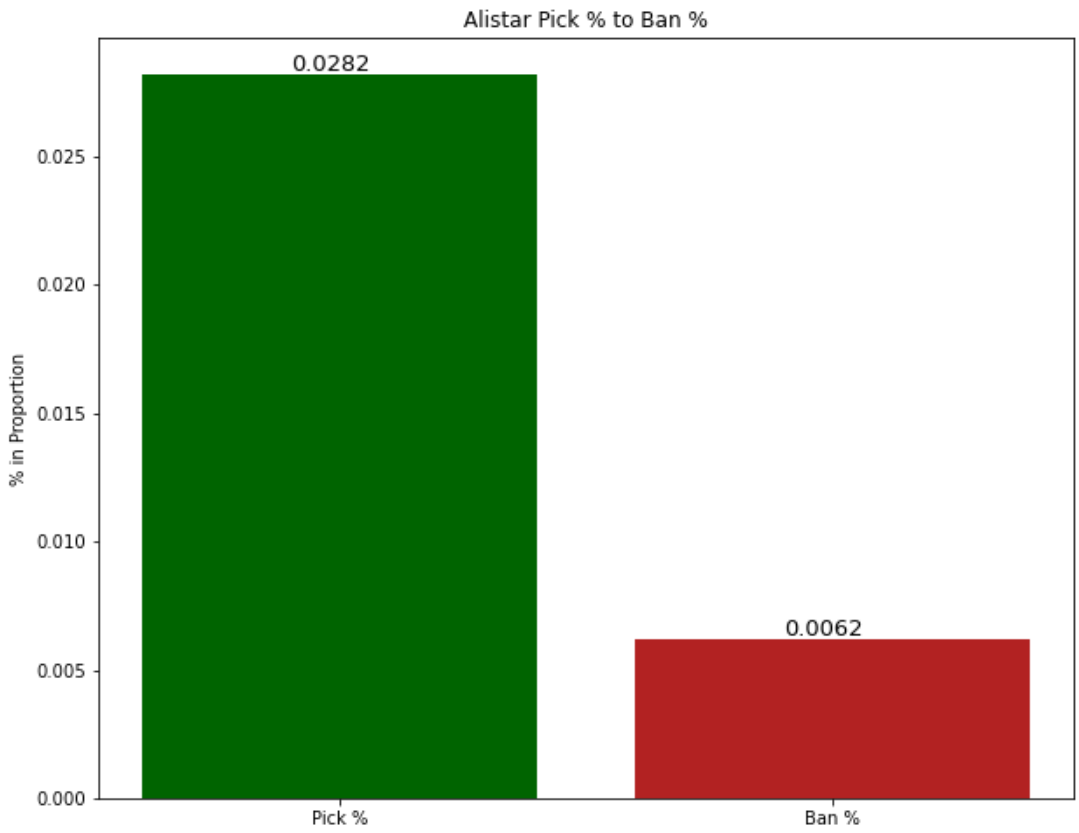


In the Top Lane, Akali's (light red bar) pick rate is in the top 2, however the numbers are still relatively low as Akali's Pick % is only 3.2% in the Top Lane. This would indicate that most players would not pick Akali or the other Assassins to be in the Top Lane.

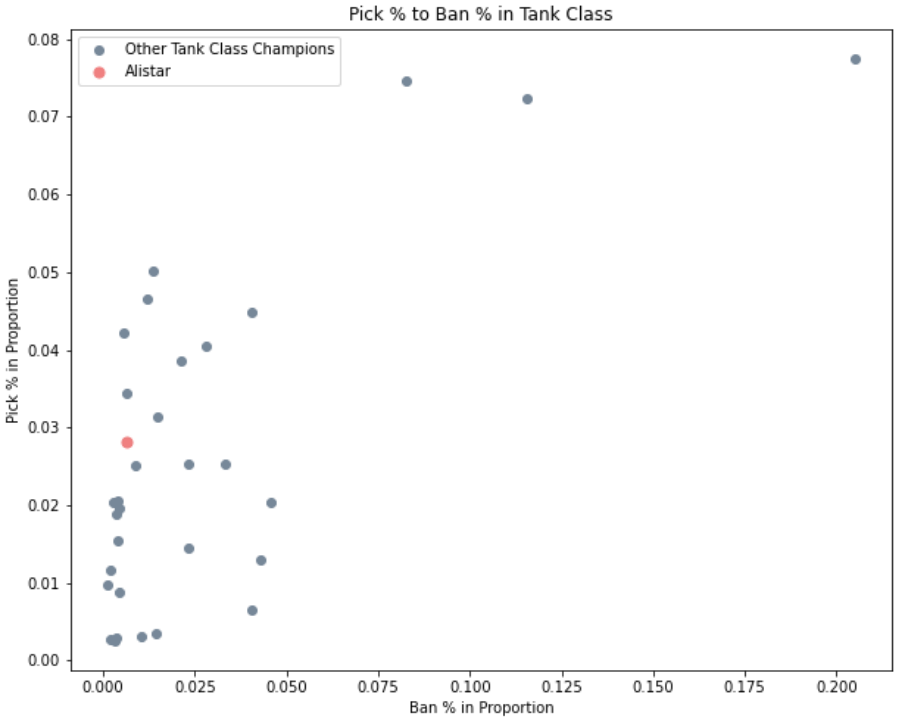


Based on the overall graph of the Mid Lane Assassins and their Pick %, Akali is also in the top 2 of the Mid Lane Assassins. This suggests that Akali does really well in the Mid Lane, therefore if a lot of players were to choose Akali, they would have a better chance of winning if they chose the Mid Lane for Akali.

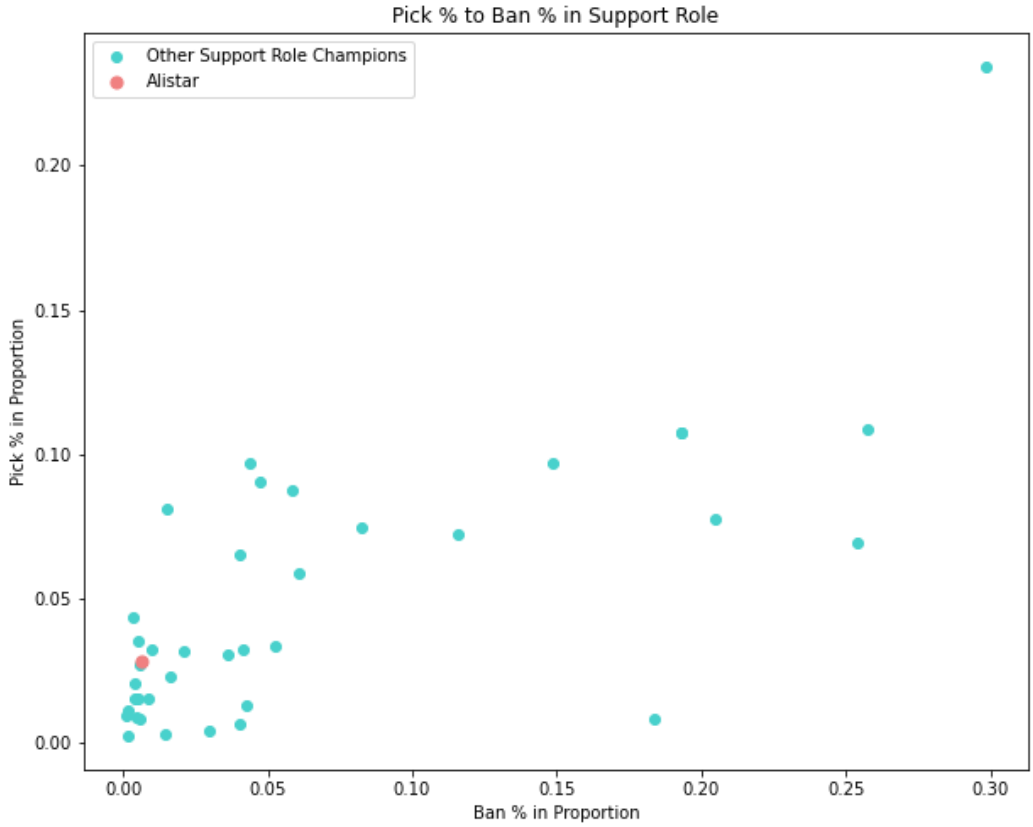
2.3. PICK % OF ALISTAR COMPARED TO HIS BAN %?



Looking at Alistar's Pick % to Ban %, it would seem like Alistar is picked exponentially more than being banned; however, the numbers only indicate that Alistar is picked 2.8% of the time which is a very small amount. Since the pick rate is so low for Alistar, the ban rate is also extremely low at 0.62%.

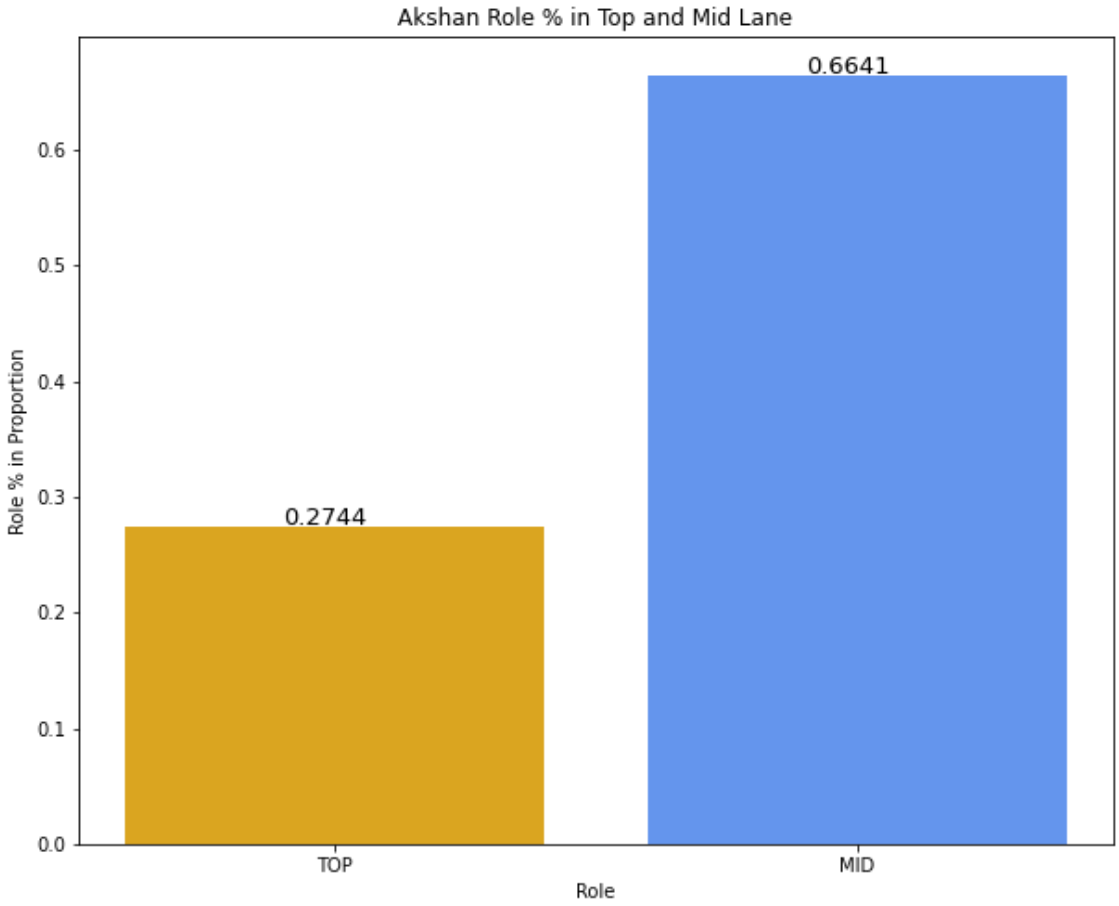


The Pick % for Alistar (light red dot) in the Tank Class is very low, nearly 3% of players picked Alistar to be a Tank. Since the pick rate is still so low for Alistar in the Tank Class, the ban rate is basically non-existent.

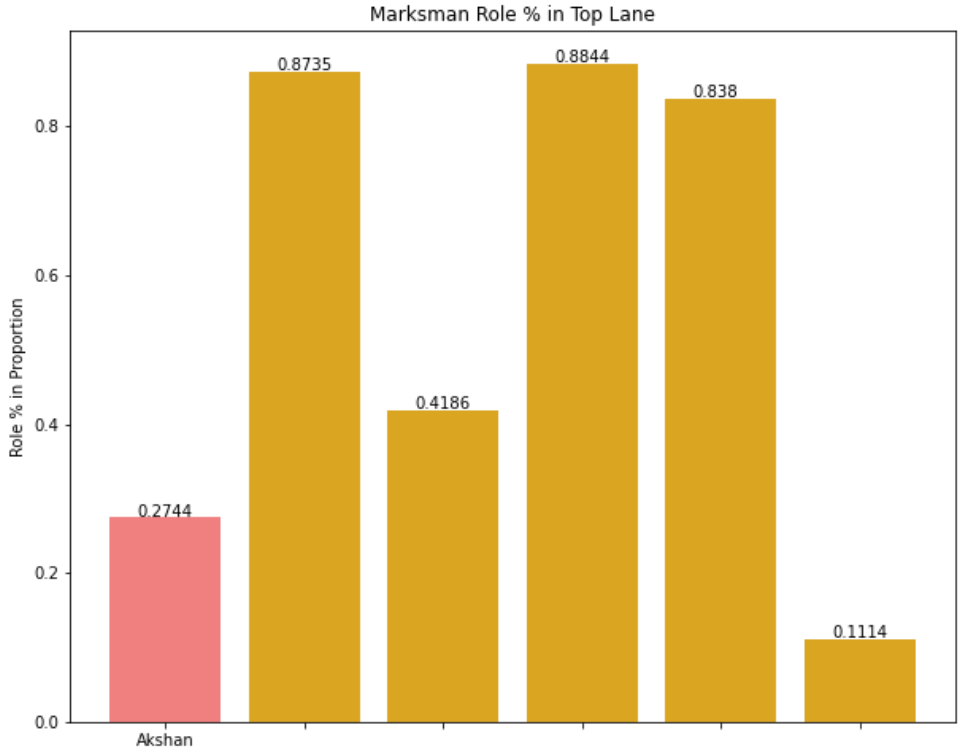


Just like the graph for the Tank Class, the Pick % to Ban % in the Support Lane is relatively small in both for Alistar. This means that Alistar is picked about 2 – 3% of the time to be in the Support Lane, and since the Pick % is so small already, Alistar is rarely ever banned.

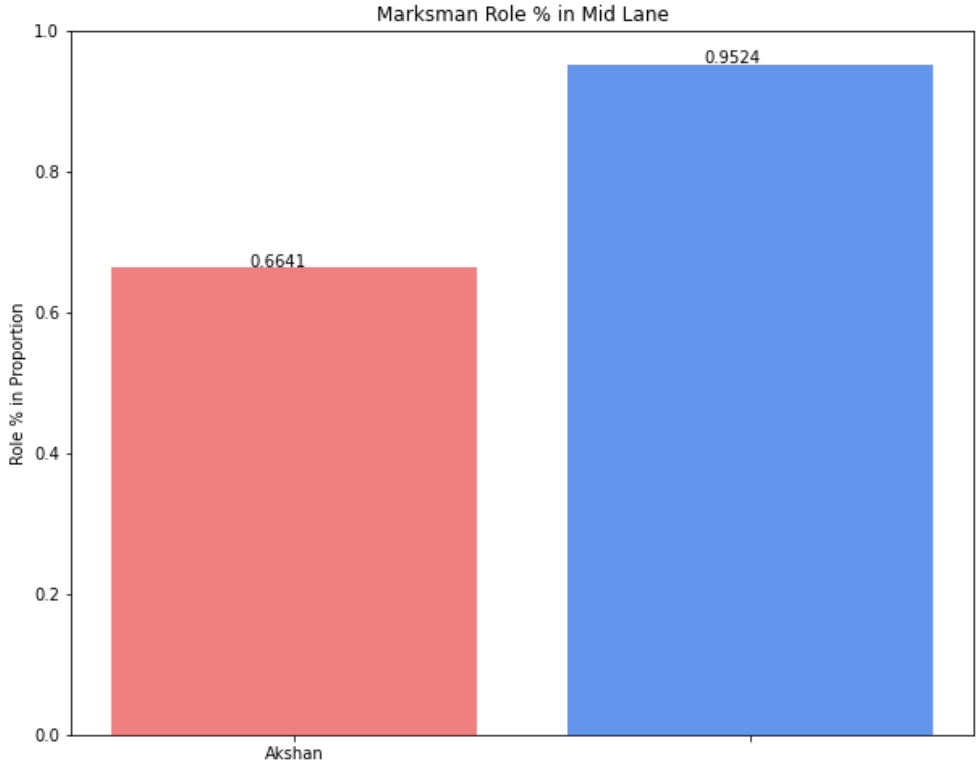
2.4. AKSHAN'S ROLE % OF TOP LANE AND MID LANE?



If the player had to choose Akshan as their champion, they would have a better chance of doing well in the game since many previous players have picked Akshan as a Mid Lane champion at 66.41% rather than a Top Lane one at 27.44%.

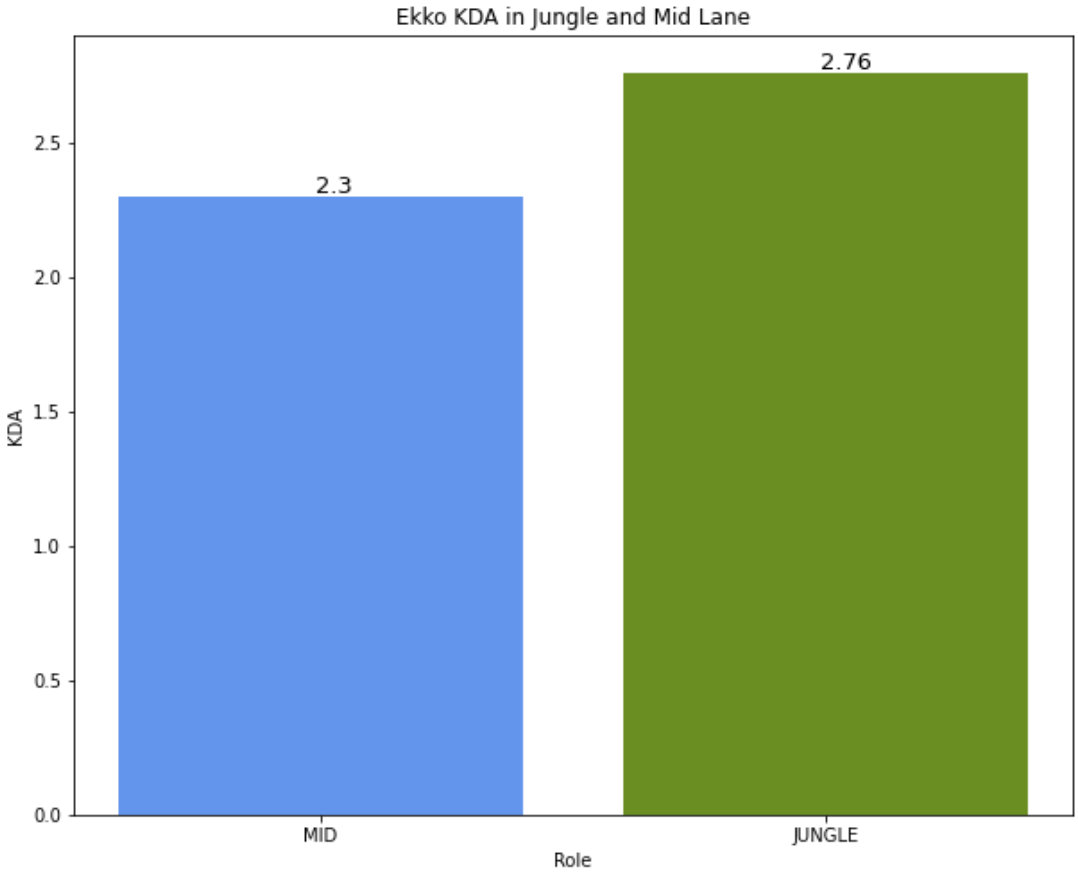


In this graph, Akshan (light red bar) is part of the bottom 2 to be picked as a Marksman Top Lane champion. This means that many players pick the top 3 Marksman champions to be a Top Lane champion over Akshan.

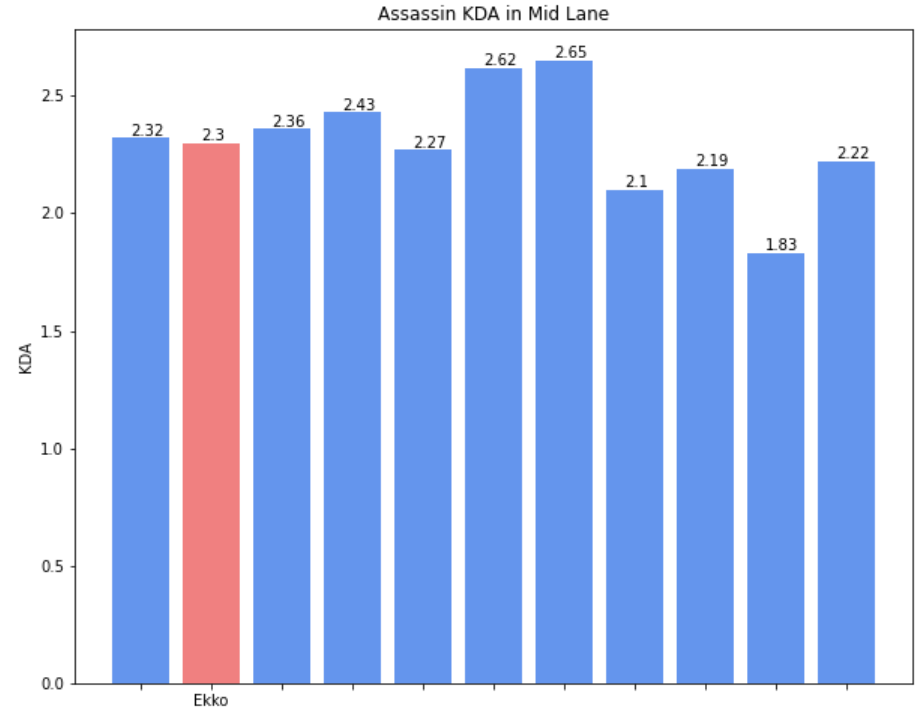


From this graph, there is only one other Marksman as a Mid Lane champion other than Akshan. This means that many players pick the other Marksman champion as a mid laner over Akshan as well. Therefore, a player would be better off not picking Akshan in the Top or Mid Lane at all.

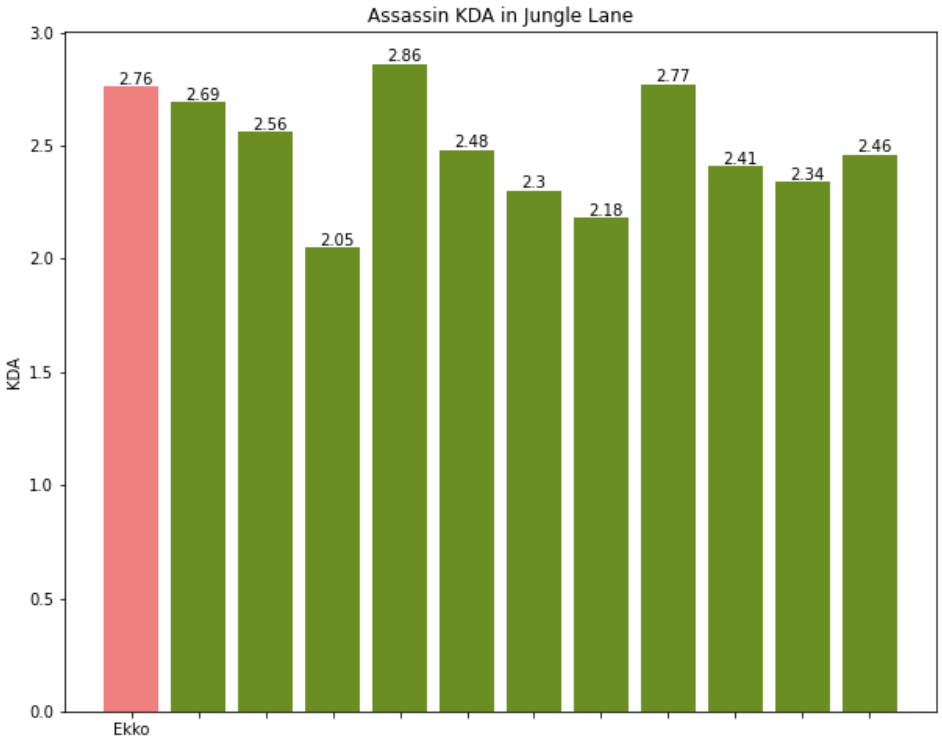
2.5. EKKO'S HIGHER KDA IN JUNGLE LANE OR MID LANE?



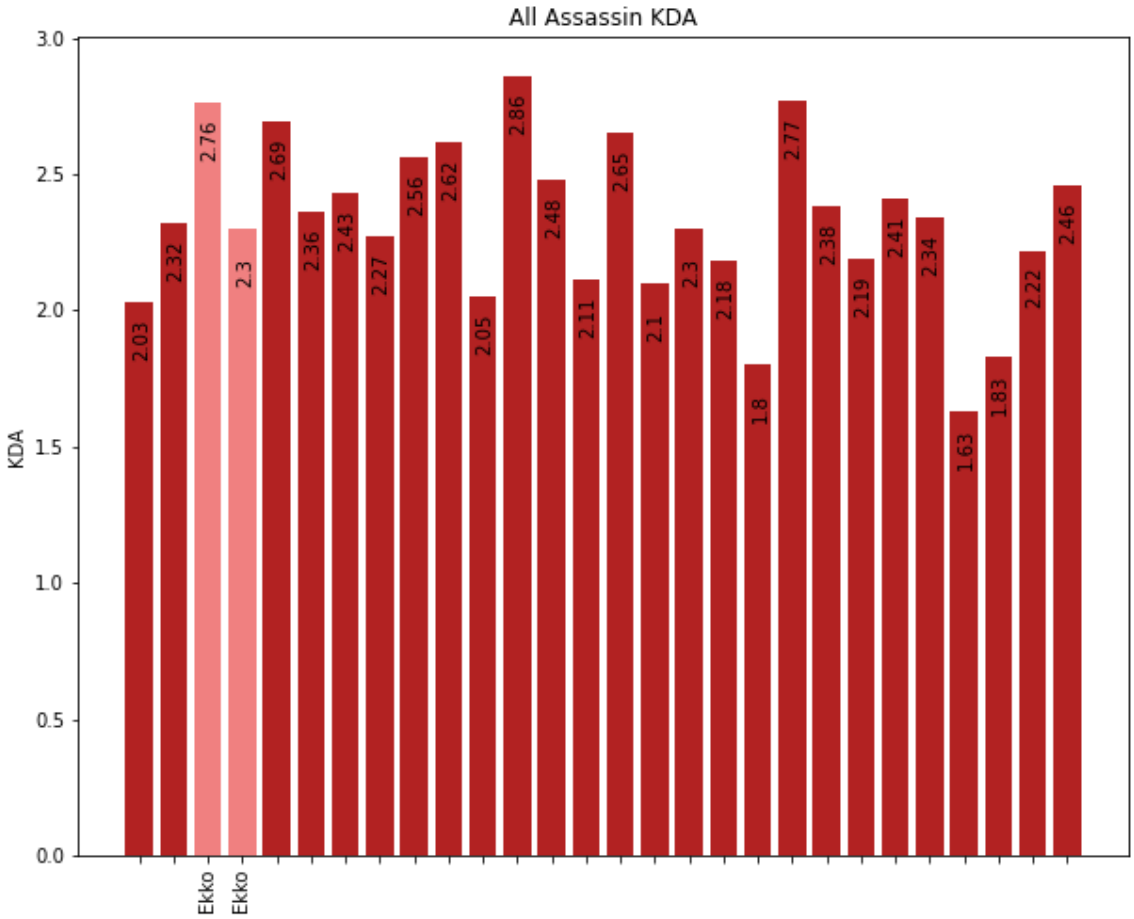
When comparing Ekko's Mid Lane and Jungle Lane KDA, Ekko's Jungle KDA is much higher; meaning it would be more worth it to pick the champion Ekko if the player wanted to choose an Assassin but wasn't sure if they should be in the Mid Lane or Jungle Lane.



The graph takes all the Assassins in the Mid Lane and compares all their KDAs. Ekko (light red bar) has a relatively average KDA score compared to the rest of the other Mid Lane champions. This could be interpreted as Ekko might not be the best pick as a Mid Lane Assassin as there are better Mid Lane Assassin champions with higher KDA scores.



This graph looks at all the Assassins in the Jungle Lane and compares all their KDAs. When compared with Ekko, Ekko has a very high KDA score as they are in the top 3. This would mean that Ekko in the Jungle Lane would be a better option to choose.



Looking at this graph, it compares all the Assassin's KDA results regardless of the champion's Role/Lane. Ekko has a relatively good KDA score for both the Mid and Jungle Lane (with the Jungle Lane having a higher KDA score). This would suggest that if the champion Ekko were to be picked, the player would have a higher chance of having high Kills and Assists (with not many Deaths) if Ekko was in the Jungle Lane.

3. Possibilities and Assumptions:

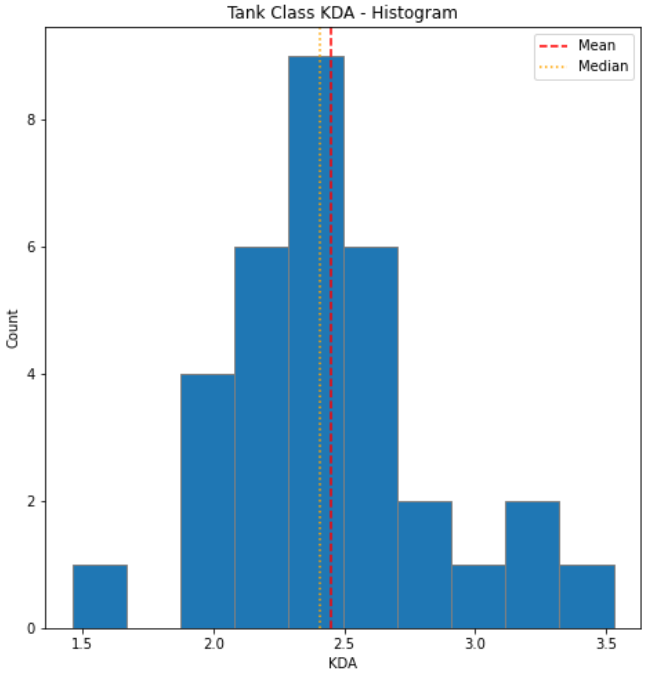
3.1. FIND THE AVERAGE KDA FOR ALL CLASSES, AND COMPARE TO THE AVERAGE KDA OF TANK CLASS

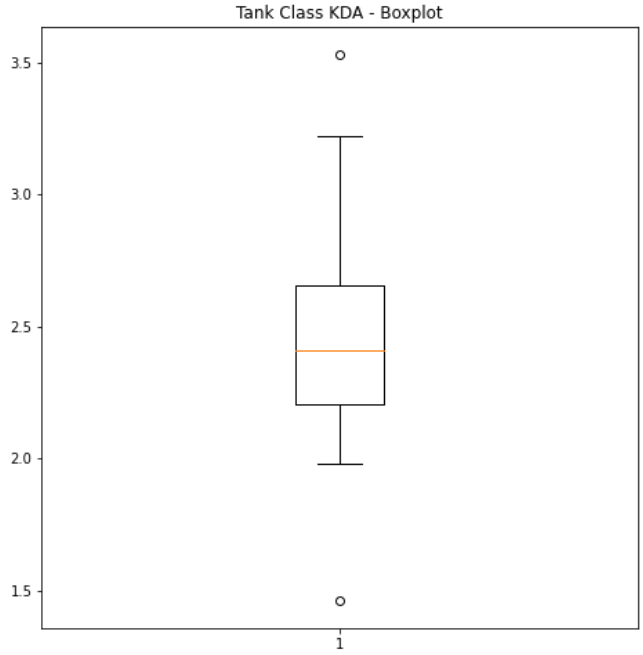
Looking at the Tank Class' KDA statistics:

- Mean: 2.45
- Standard Deviation: 0.405
- Standard Error: 0.072
- 95 Percentile: 1.86 to 3.29

This means that 95% of the graph for the Tank Class has KDA scores between 1.86 to 3.29.

- Q1: 2.203
- Q2 (Median): 2.41
- Q3: 2.66
- Interquartile Range (IQR): 0.4525
- Lower Fence: 1.524
- Upper Fence: 3.33





Even through the graph looks like it has a normal distribution, it's actually skewed slightly to the right because the mean (2.45) is larger than the median (2.41).

We want to know if the average KDA for the Tank Class is the total KDA average for all classes (2.311) or not.

$$\boldsymbol{H_0}: \boldsymbol{\mu = 2.311}$$

$$\boldsymbol{H_1}: \boldsymbol{\mu \neq 2.311}$$

Taking the Tank Class KDA dataset, that will be compared with the average KDA mean at 2.311 and both are plugged into a the Python library *scipy.stats* and gives us the p-value using the One Sample T-Test equation.

$$\boldsymbol{p - value}: \boldsymbol{0.0576}$$

The p-value describes the likelihood of seeing the Tank Class' sample mean (2.45) over the KDA average for all classes, or the population mean (2.311). Since the p-value is greater than 0.05 at 0.0576, the null hypothesis (H_0) is **not** rejected. This basically states that there is about 5.8 out of 100 chances that the mean for the Tank Class is 2.311.

3.2. ASSOCIATION BETWEEN ROLES AND CLASSES?

We want to see if there's an association between the classes and the types of roles/lanes they are in.

$$H_0: \textbf{There is an association between roles and classes}$$

$$H_1: \textbf{There is not an association between roles and classes}$$

Using the Python library *pandas*, we will be able to create a table to look at how the roles and classes compare.

Role	ADC	JUNGLE	MID	SUPPORT	TOP
Class					
Assassin	0	12	11	2	3
Controller	0	1	1	10	0
Fighter	2	21	7	1	34
Mage	5	4	30	13	4
Marksman	20	2	2	1	6
Tank	0	7	3	12	10

Using the same Python library for the last question, *scipy.stats*, we will use the Chi-Square Contingency equation to plug in our values to get the p-value.

$$p - value: \mathbf{0.000000000000000000000000000000000001310}$$

As you can see from the p-value, the null hypothesis is rejected. This states that there is absolutely no relation between the types of roles/lanes and classes because there can be multiple champions of the same class throughout each role, but there cannot be multiple champions in the same role/lane.

The rules of League of Legend require one player to one role/lane, however, it does not matter what class of champion they use. A picked champion can only be used once per player as well.

3.3. IN THE SUPPORT LANE, IS IT MORE LIKELY FOR A MAGE OR TANK TO BE PICKED?

First the Baseline Conversion Rate, Minimum Detectable Effect, and Significance Threshold for the Mage class needs to be found to find the sample size.

To find the Baseline, divide the number of Mages in the Support Lane by the number of champions in the Support Lane.

$$\boldsymbol{Baseline = \frac{\#\ of\ Mages\ in\ Support}{\#\ of\ all\ champions\ in\ Support}}$$

$$\boldsymbol{Baseline = 33.3333\%}$$

Suppose that 33.3333% of players will choose the Mage Class to be in the Support Lane; we are thinking of creating a couple more Mage champions to be in the Support Lane, but it may only be worth it if at least **35%** of players were to choose Mage champions in the Support Lane.

To find the Minimum Detectable Effect, we know the current baseline at 33.3333%, and the new baseline is at 35%. We then plug in those numbers to the equation below.

$$\boldsymbol{Minimum\ Detectable\ Effect = (\frac{New\ Baseline - Baseline}{Baseline}) * 100}$$

$$\boldsymbol{Minimum\ Detectable\ Effect = 5.0\%}$$

The Significance Threshold is the false positive rate for the test, and **95%** is the most common to use, therefore we will use it too.

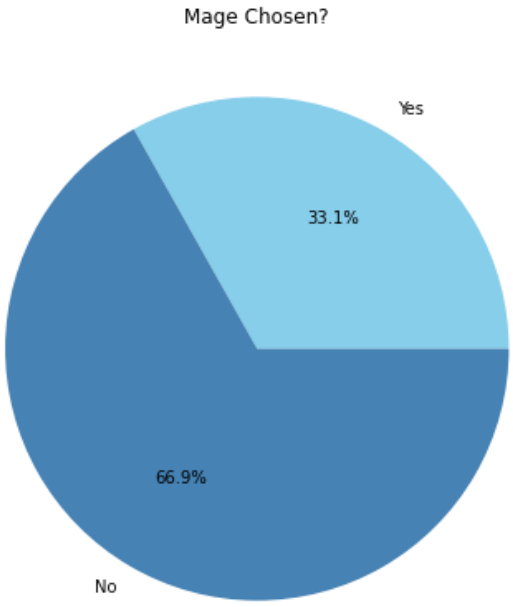
After plugging in all three values into a Sample Size Calculator for this A/B Test, we will need a sample size of at least **11,000 players**.

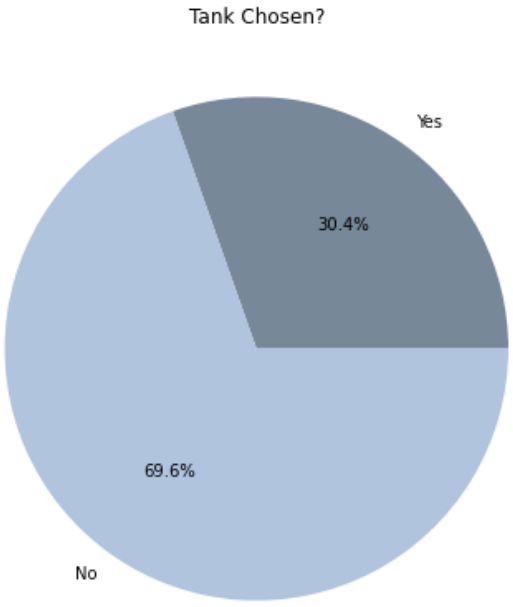
To get the probabilities of players that will pick either Mage or Tank in the 12.4 patch, we will need to take the number of Mage champions in Support (this is the baseline we used earlier), as well as the Tank champions in Support.

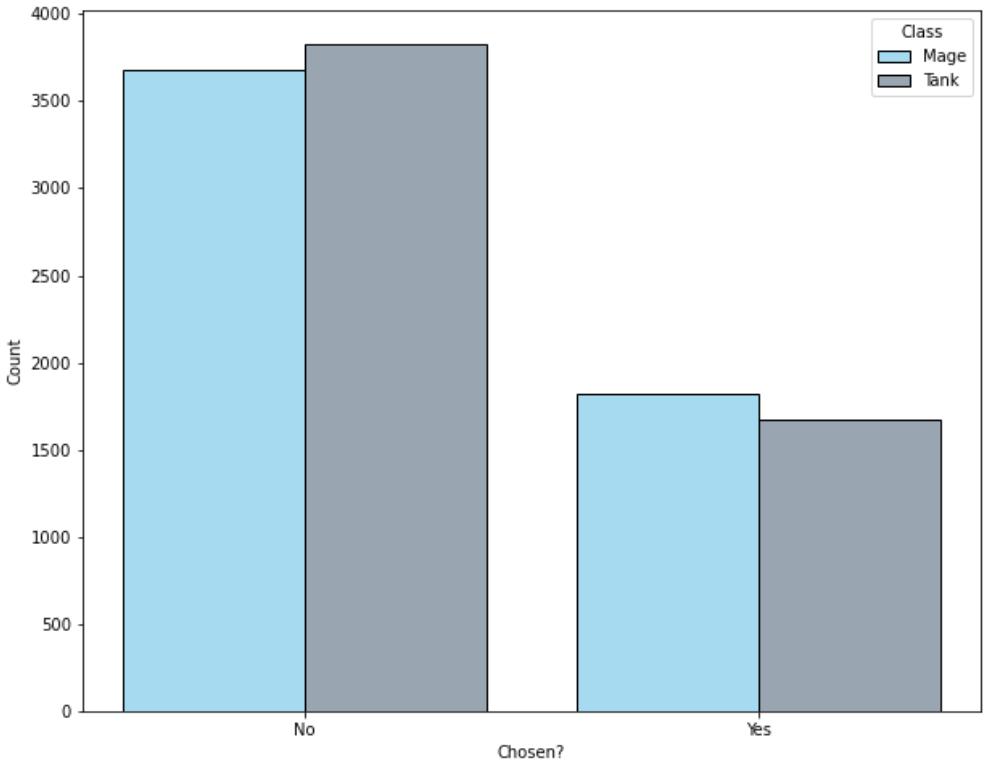
Mages Champions in Support Lane: 33% of Total Support Lane Champions

Tank Champions in Support Lane: 31% of Total Support Lane Champions

Now we can use the probabilities to simulate a dataset of 11,000 players using a randomizer in Python to get the results and visualize them to see how many players would choose a Mage or Tank champion, theoretically.







So, we can see that with running the A/B Test, it is more likely that choosing either a Mage or Tank in the Support Lane will be 'No'; however, the Mage is more likely to get chosen over the Tank if in a Support Lane. Therefore, it may not be worth it to create new Mage champions in the Support Lane as they're not likely to get chosen.

3.4. WHAT CLASSES ARE BETTER BASED ON SCORES?

The independent variable is the class type, which has the following classes:

- Fighter
- Assassin
- Mage
- Marksman
- Controller
- Tank

We want to find out if there's a difference in score between the classes compared to the population mean.

$$\boldsymbol{H_0: There\ is\ no\ difference\ to\ the\ population\ mean}$$

$$\boldsymbol{H_1: There\ is\ at\ least\ one\ class\ that\ differs\ significantly\ from\ the\ overall\ mean}$$

Using the Python library *scipy.stats*, we will use the ANOVA Test to look at the dataset of all the different classes' scores and find the p-value.

$$\boldsymbol{p - value: 0.1796}$$

Due to the p-value being greater than 0.05, we will not reject the null hypothesis. This means that each of the classes' scores are not significantly different from the population mean.

Conclusion

This is only a very small percent of data that's been analyzed as we only looked at the data and patches for the twelfth season of League of Legends. There were also several more areas that could have been looked at, or more questions to by hypothesized.

However, from the overall data that was analyzed, we can see that the developers of League of Legends will make some champions slightly stronger or weaker with each new patch that comes out. This is done so there will always be a 50% chance of winning or losing plus or minus 1 – 3%. The game is meant to give all the players equal footing for each round and wining is determined more on the player's ability rather than the champions.