

Decision Tree Application for Choosing Champions in League of Legends

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Abstract—The League of Legends game has been one of the most played Multiplayer Online Battle Arena games these days. With 147 champions available for players to play, sometimes it is hard for players to choose one amongst them that suits their playstyle. From Discrete Mathematics, we learn about the concept of tree. Tree concept can be used for many purposes in life, and of the example of tree is a Decision Tree. This paper will show how to choose a champion using a Decision Tree.

Keywords—Tree, Decision Tree, Roles, Champions

I. INTRODUCTION

League of Legends is a Multiplayer Online Battle Arena (MOBA) game which has been around since 2009. Back then, there was only 17 champions available for players to play. Now, it's already been 10 years since the game's release date and the champions pool are getting bigger and bigger. Right now, there are 147 champions available to play.

With so many champions to pick, players are often confused on which champion that they have to choose, especially new players. From 147 champions, those champions have their own unique play style that can be sorted out to some categories (roles).

Roles are a category that could sort champions to their play style. There are a few type of roles, main roles, is a category that separate champions based on their usual lanes. Under the main roles, there are also sub-roles, which separate those champions based on their lane to their stats, skill stats, and many more.

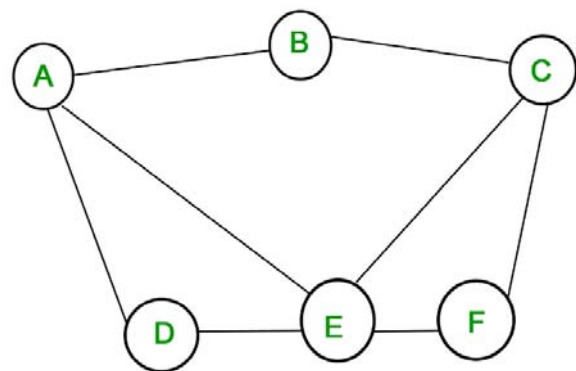
From the lesson of Discrete Mathematics, we learned about graphs and various types of graphs. There is one type of graph called tree. While graph could connect two objects with more than one relation, tree isn't, hence tree is called undirected graph. Tree also have various types, and we will use the concept of Decision Tree in this paper.

In a Decision Tree concept, there are things called root, nodes, and edges. This concept can be used to help League of Legends players to pick their champions. For this implementation, the roots would be the main roles, the nodes would be the sub-roles, and the edges would be the play style that the players want to play.

II. GRAPH

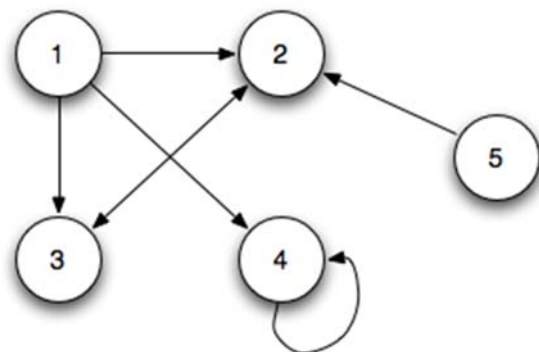
Graphs are discrete structures consisting of nodes and edges

that connect these nodes. Graphs have various kinds, the ones that has directions on its edge and the ones that don't and the ones that has loop on it. The nodes are named with alphabet or numbers, for example B or C, while the edge are named by the nodes it connects, for example (B, C).



Source: <https://www.geeksforgeeks.org/mathematics-graph-theory-basics/>

Here is the example for directed graphs that has a loop on it.



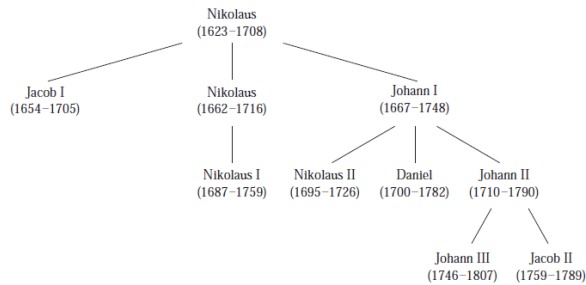
Source: <http://ycpcs.github.io/cs360-spring2015/lectures/lecture15.html>

III. TREE

A. Definition

Tree is one of the many kinds of graphs, it is named tree because it resembles one. Tree is an undirected graph that doesn't have any circuit on it. An example of a tree is the

Bernoulli family tree.



Source: Rosen, Discrete Mathematics and Its Applications, 7th Edition, 2009.

A tree has some properties. The most general properties in a tree are Parent, Child, and Leaf. From the picture above, Nikolaus (1623-1708) is the Parent to its Child, which is Jacob I (1654-1705), Nikolaus (1662-1716), and Johann I (1667-1748). Parent can also be called a node that has n-degree. Meanwhile, a Leaf is a node that has no Child, or has zero degree, for example Jacob I (1654-1705). A Parent that has no Parent can also be called Root. Another properties of a Tree is a Path. The length of a Path is the total of edges that must be passed to get to a node. For example, the Path to Nikolaus I (1687-1759) is Nikolaus (1623-1708) and Nikolaus (1662-1716), so the length is 2.

B. Rooted Tree

Rooted Tree is a tree that has a node that act as a Root. An Unrooted Tree can be transformed into a Rooted Tree by choosing a node to act as a Root, then direct each of its nodes that has an edge starting from the Root.

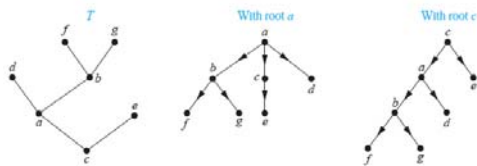


FIGURE 4 A Tree and Rooted Trees Formed by Designating Two Different Roots.

Source: Rosen, Discrete Mathematics and Its Applications, 7th Edition, 2009.

C. Decision Tree

Decision Tree is an application of a Rooted Tree. A Rooted Tree that its nodes consist of decisions and its Leaf consist of the solution of a problem is called Decision Tree. In conclusion, the solution of the problem corresponds to the decisions made along the Path of the tree.

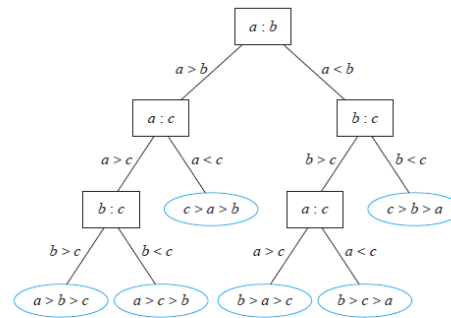


FIGURE 4 A Decision Tree for Sorting Three Distinct Elements.

Source: Rosen, Discrete Mathematics and Its Applications, 7th Edition, 2009.

IV. LEAGUE OF LEGENDS CHAMPIONS

In League of Legends game, the character available for the players to play is called champions. Currently, there are 147 champions available to play in the game, but for this paper, we only put a few for the new players of this game.

Generally, champions have been classified by their main roles, which is divided by their lane (position) in the game. There are 5 conventional positions, Top, Mid, Jungler, AD Carry, and Support. These main roles can also have their own classifications based on the champions stats, skill sets, and play styles.

A. Top



Source: <https://euw.leagueoflegends.com/de/news/esports/esports-editorial/fur-top-laner-fuehren-viele-wege-zum-sieg>

1) Tank

Top Champions that classifies as Tank have high defensive stats. Their main purpose in the game is to be a “shield” for their team and receive the damages dealt from the enemy front-liners.

Example: Ornn

2) Bruiser

Bruisers tend to have balanced defensive and offensive stats. Commonly, they’re placed on the front-line, but not for being a “shield” to their team but to do damage to the enemy front-liners.

Example: Darius

- 3) **Fighter**
Fighters are the exact opposite of Tanks. They have high stats on the offensive side, so all they do is deal damage as much as possible to the enemy team. Fighters also have to watch their position when in a team fight because they can get easily killed. Fighters have its own classifications too.

a) **Attack Damage (AD)**
AD Fighter means that their damage scales off Attack Damage, which they get from items that increased the Attack Damage stats.
Example: Fiora

b) **Ability Power (AP)**
AP Fighter means that their damage scales off Ability Power, which they get from items that increased the Ability Power stats.
Example: Ekko

- 4) **Split Pusher**
Split Pusher champions often not joining their team while their team is doing a team fight. Instead of joining their team, Split Pushers focused on destroying the enemy's turrets on a different lane.
Example: Tryndamere



Source: <https://www.riftherald.com/lol-gameplay/2018/11/19/18098895/turret-plating-preseason-season-9>

B. Mid



Source: <https://blog.gamersensei.com/article/warding-101-guide-mid-lane/>

- 1) **Attack Damage**
AD Mid-laner is the main damage dealer that scales off their Attack Damage stats.
Example: Yasuo
- 2) **Ability Power**
AP Mid-laner is the main damage dealer that scales off their Ability Power stats. AP Mid-laners also have their own classifications.
 - a) **Burst**
Burst AP Mid-laner is a huge damage dealer in a short amount of time.
Example: Brand
 - b) **Poke**
Poke AP Mid-laner don't do fights with their opponents constantly. Instead, they uses their skill constantly to deal some damage to their opponents.
Example: Karma
 - c) **Crowd Control**
Champions that classifies as Crowd Control Mid-laner are champions that have the skill set to interfere with their enemy's movements, like stuns, roots, or even disabling their enemy's skills for a while.
Example: Veigar

C. Jungler



Source: <https://na.leagueoflegends.com/en/news/game-updates/gameplay/preseason-2020-gameplay-rise-elements>

- 1) **Tank**
Their main purpose in the game is to be a "shield" for their team and receive the damages dealt from the enemy front-liners.
Example: Amumu
- 2) **Assassin**
Assassin champion's main purpose in the game is to help their other laners to kill their opponents in their respective lane with dealing a lot of damage in a quick amount of time. Assassin jungler also classified into AD Assassin and AP Assassin.

Example: Nocturne, Evelynn

3) Split Pusher

Split Pusher champions often not joining their team while their team is doing a team fight. Instead of joining their team, Split Pushers focused on destroying the enemy's turrets on a different lane.

Example: Udyr

D. AD Carry



Source: <https://www.wikihow.com/Play-As-ADC-in-League-of-Legends>

1) Hyperscale

Hyperscale AD Carry gets stronger as they build their items. These champions deal a lot of damage in the late game, but pretty weak in the early game, usually because their lack of range.

Example: Kai'sa

2) Mid-Game

Mid-Game AD Carry usually get very strong after they build their first item, but they don't scale too well into the late game.

Example: Lucian

3) Utility

These champions have their own initiation tool for fights, which is rare for an AD Carry. Their weakness is the lack of mobility they possess, and they often be an easy target because their lack of mobility.

Example: Ashe

E. Support



Source: <https://na.leagueoflegends.com/en/game-info/champions/sona/>

1) Poke

Poke Supports constantly deals damage to their enemy by using their skills.

Example: Zilean

2) Initiator

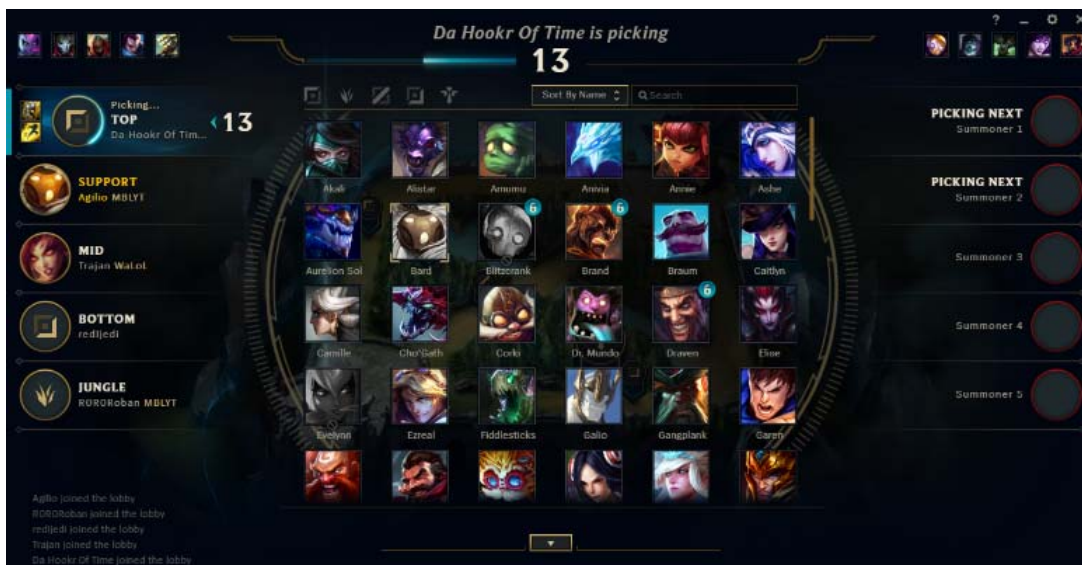
Initiator Supports focused mainly on initiating a fight with their crowd-control skills.

Example: Alistar

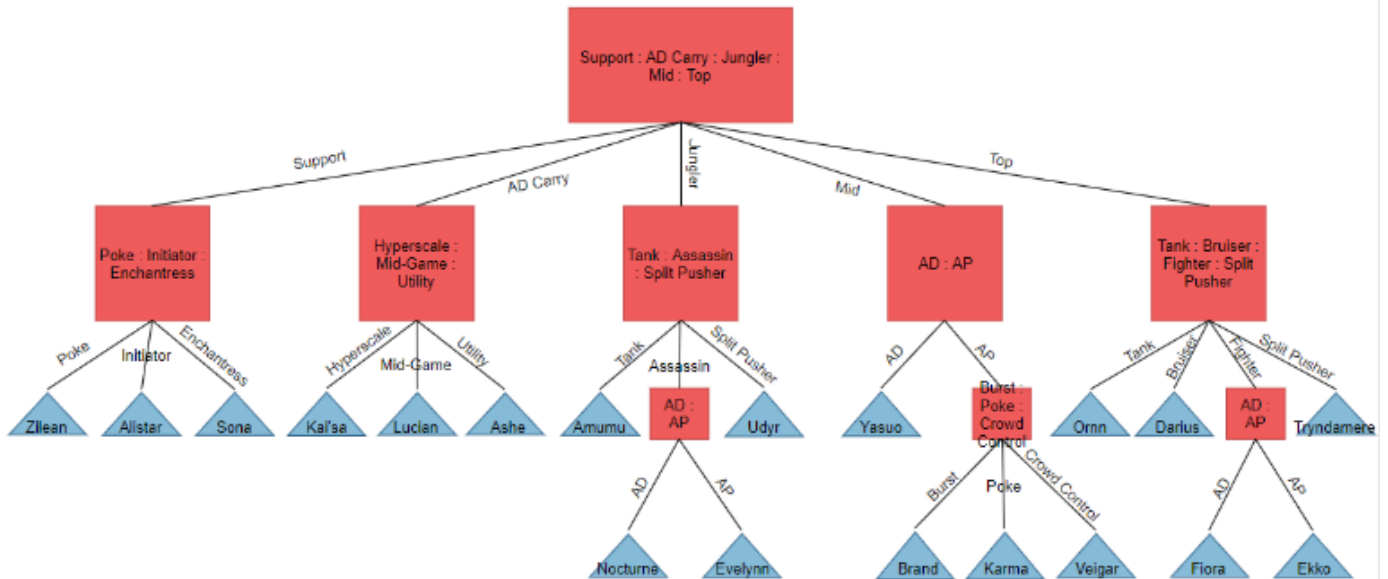
3) Enchantress

Enchantress skill sets mostly have the effect of buffing their AD Carry.

Example: Sona



V. IMPLEMENTATION OF DECISION TREE TO CHOOSE LEAGUE OF LEGENDS CHAMPIONS



First, we decide which lane do we want to play. Choose one of the 5 lanes that exist, Top, Mid, Jungler, AD Carry, or Support.

1. If we decided to play the support role, we should consider what the rest of the team need.
 - a. If our team lacks ranged damage, we should pick a Poke Support, for example Zilean.
 - b. If our team lacks a team fight initiator, we should pick an Initiator Support champion like Alistar.
 - c. If we want to play it safe and just help our AD Carry to outplay the enemy from his back, we should pick an Enchantress Support.
2. If we decided to play the AD Carry role, we should consider what play style that's comfortable for us to play.
 - a. If we're aiming for a long game, we should choose a Hyperscale AD Carry like Kai'sa.
 - b. If we're not that confident to be able to carry our team throughout the game and afraid that we will lose momentum of a good gameplay, we should go for a Mid-Game AD Carry like Lucian.
 - c. If conventional AD Carry that only relies on their team to cover them from the enemies is not comfortable for us to play, then we should go for Utility AD Carry like Ashe that have her own crowd control skills.
3. If we decided to play the Jungler role, we should consider what type of Jungler that our team need.
 - a. If there is no Tank or we feel like there should be more Tank, we should pick Tank champions like Amumu.
 - b. If our team doesn't have a champion that could do a lot of damage in an instant, we should pick an

Assassin.

- i. If we think that there should be more champions that deals Attack Damage in our

team, we should go for AD Assassin Jungler. Nocturne is a good choice for this.

- ii. If we think that there should be more champions that deals Ability Power damage in our team, we should go for AP Assassin Jungler. Therefore, we should choose Evelynn.
- c. If our team already has a good composition of champions and we feel like it is okay for them to go into a team fight without us, Split Pusher Jungler is a good decision for us. For example, Udyr's attack speed is very fast that he could destroy the enemy's turrets in a short amount of time.
4. If we decided to play on the Mid lane, we should consider our play style.
 - a. If we're comfortable with playing Attack Damage champions, then we should choose an AD Mid like Yasuo.
 - b. If we choose to play AP Mid laner,
 - i. If we want to deal a lot of damage in a short amount of time, we should choose a Burst AP Mid laner, for example Brand.
 - ii. If we're not confident on doing an all-out fight with the enemy mid-laner, we should go for a Poke AP Mid laner like Karma because the range and short cooldown on her skills.
 - iii. If our team lacks of crowd control skills, we should go for a champion that has heavy crowd control skills, like Veigar.
5. If we decided to play on the Top lane, we should consider what our team needs and what play style that's comfortable for us to play.
 - a. If our Jungler or Support plays a non-Tank

- champion, we should pick a Tank champion to be the “shield” for our team. An example for a good Tank Top laner is Ornn.
- b. If we want to constantly going into fights but still have a pretty good stats on defense, we should pick a Bruiser champion like Darius.
 - c. If we want to constantly going into fights and deal a lot of damage to the enemy team, we should pick Fighter champions.
 - i. If we want to play champions that scales off Attack Damage, we should pick champions like Fiora.
 - ii. If we want to play champions that scales off Ability Power, we should pick champions like Ekko.
 - d. If we only want to focus on the objectives of this game (turrets, jungle buffs), we should go for a high attack speed and has a good mobility champions like Tryndamere.

VI. CONCLUSION

Tree can be used in many things in our life. We could even implement the concept of tree in things like games. There are various kinds of concept of tree. One of them and what we used in this paper is called Decision Tree.

Decision Tree is a concept of tree that compares two or more decisions. With Decision Tree, we could know what’s the best outcome and what are the steps to achieve that outcome to our problems. In this case, we used it to help League of Legends players to choose which champion to play.

This Decision Tree can be useful for beginners that still trying out different champions to play. Beginners often don’t know what to choose or what to consider during champion picks. This caused them to choose whatever champion they want without thinking. This Decision Tree help them to know what are the things that they should consider while they’re choosing champions to make the perfect composition of their team.

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PERNYATAAN

Dengan ini saya menyatakan bahwa makalah yang saya tulis ini adalah tulisan saya sendiri, bukan saduran, atau terjemahan dari makalah orang lain, dan bukan plagiasi.

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