Draft Analyzer

1. Modeling

1.1. Defining Items and Objects

Let us define a champion by an ID: each champion has a unique ID between 1 and 170 (since there are currently 170 champions).
Let us define the Victory-Defeat matrix $M \in M_{170}(\mathbb{N})$.
For $(i,j) \in [\![1;170]\!]^2$, the coefficient$M_{i,j}$ represents the number of victories of champion i over the champion j.
Consequently we can have the number of win $w_i \in \mathbb{N}$ and the number of loose $l_i \in \mathbb{N}$.

$$w_i = \frac{\sum_{k=1}^{170} M_{i,k}}{5}$$
$$l_i = \frac{\sum_{k=1}^{170} M_{k,i}}{5}$$

w_i will be the sum of the line i and l_i will be the sum of the column i . We will explain later why these sums are divided by 5.

1.2. Draft

What is a draft ? A draft is the selection of 5 champions against 5 others champions, all of which are distinct. Mathematically, we can define a draft as a 10-tuple, denoted by D :

$$D = (x_1, x_2, x_3, x_4, x_5, x_5, x_6, x_7, x_8, x_9, x_{10})$$
$$\forall (i,j) \in [\![1,10]\!] \text{ we have : } \ x_i \neq x_j$$

The draft is divided into two teams: the “Red” team and the “Blue” team. We can define these teams as two $5-$tuple: R and B:

$$R = (x_1, x_2, x_3, x_4, x_5)$$
$$B = (x_5, x_6, x_7, x_8, x_9, x_{10})$$

And finnaly after a match one of the two team win and the other team loose and we need to update M.
After a match, one team wins and the other loses, and we update the matrix M accordingly. For each victorious champion, we add 1 to each column corresponding to the defeated champions of the opposing team. Since there are 5 champions on each team, this explains why we divide by 5 when calculating the number of wins and losses.

1.3. Probability

Now let’s create your model to calculate probability of win of the “Red” or “Blue” with the history of the last match.
First define define the “Strength of a champion” called S_i :

$$S_i = \sum_{k=1}^{5} \left(\left(\frac{w_{x_k}}{w_{x_k} + l_{x_k}} \right) \frac{1}{3} + \left(\frac{M_{i,k}}{M_{i,k} + M_{k,i}} \right) \frac{2}{3} \right)$$

Lets add details about S_i :

- i is the indice of the champion in draft.

- x_i is the indice of the chmapion in the oppenent team for $i \in [\![1, 5]\!]$.
- $\frac{1}{3}$ and $\frac{2}{3}$ are weights for the general win probability and for the direct matchup.

Now we can define the "Strength of team" for the "Red" and for the "Blue" : S_R and S_B

$$S_t = \sum_{k=1}^{5} S_k$$

with $t \in \{R, B\}$

Now lets use the logistic function to have the probabilty of winnig of one side :

$$\mathbb{P}_R = \frac{1}{1 + e^{-(S_R - S_B)}}$$

2. Historical of draft and command in Prolog

```
initialiser(Matrix).
```

2.1. KC - TL :

	Victory					Defeat				
Game 1 **TL Victory**	Ornn	Maokai	Tristana	Varus	Nautilus	Jayce	Vi	Aurora	Ezreal	Rell
Game 2 **KC Victory**	Camille	Sejuani	Azir	Miss Fortune	Leona	Ambessa	Skarner	Aurelion Sol	Ashe	Pantheon
Game 3 **TL Victory**	K'Sante	Nocturne	Taliyah	Lucian	Nami	Gnar	Xin Zhao	Ahri	Zeri	Yuumi

Add victory in matrix of the match :

```
add_victory('Ornn','Maokai','Tristana','Varus','Nautilus','Jayce','Vi','Aurora','Ezreal','Rell').
add_victory('Camille','Sejuani','Azir','Miss
Fortune','Leona','Ambessa','Skarner','Aurelion Sol','Ashe','Pantheon').
add_victory('K\'Sante','Nocturne','Taliyah','Lucian','Nami','Gnar','Xin
Zhao','Ahri','Zeri','Yuumi').
```

2.2. TES - HLE

2.2.1. Calcul of winnig proba of the draft

TES-HLE
load_matrix('matrix.txt',Matrix),win_proba_draft('Jax','Skarner','Azir','Ezreal','Alistar','Kennen','Vi','Aurora','Miss Fortune','Leona',Matrix,P). Matrix = [[0, 0, 0, 0, 0, 0, 0, 0|...], [0, 0, 0, 0, 0, 0, 0|...], [0, 0, 0, 0, 0, 0|...], [0, 0, 0, 0, 0|...], [0, 0, 0, 0|...], [0, 0, 0|...], [0, 0|...], [0|...], [...|...]|...], P = 0.47834688488309984.
wrong result

load_matrix('matrix.txt',Matrix),win_proba_draft('Gragas','Nocturne','Orianna','Kalista','Renata Glasc','Aatrox','Nidalee','Akali','Varus','Poppy',Matrix,P). Matrix = [[0, 0, 0, 0, 0, 0, 0, 0|...], [0, 0, 0, 0, 0, 0, 0|...], [0, 0, 0, 0, 0, 0|...], [0, 0, 0, 0, 0|...], [0, 0, 0, 0|...], [0, 0, 0|...], [0, 0|...], [0|...], [...|...]|...], P = 0.5.

2.2.2. Draft TES - HLE with victory

Victory	Defeat

Game 1 **HLE Victory**	Jax	Skarner	Azir	Ezreal	Alistar	Kennen	Vi	Aurora	Miss Fortune	Leona
Game 2 **HLE Victory**	Aatrox	Nidalee	Akali	Varus	Poppy	Gragas	Nocturne	Orianna	Kalista	Renata Glasc

```
add_victory('Jax','Skarner','Azir','Ezreal','Alistar','Kennen','Vi','Aurora','Miss
Fortune','Leona').
add_victory('Aatrox','Nidalee','Akali','Varus','Poppy','Gragas','Nocturne','Orianna','Kalista','Ren
Glasc').
```

2.3. KC - CFO

load_matrix(‘matrix.txt’,Matrix),win_proba_draft(‘Ambessa’,‘Vi’,‘Aurora’,‘Kai'Sa’,‘Rakan’,‘Rumble’,‘Skarner’,‘Viktor’,‘Ez
Matrix = [[0, 0, 0, 0, 0, 0, 0, 0|...], [0, 0, 0, 0, 0, 0, 0|...], [0, 0, 0, 0, 0, 0|...], [0, 0, 0, 0, 0|...], [0, 0, 0, 0|...],
[0, 0, 0|...], [0, 0|...], [0|...], [...|...]|...], P = 0.4419298941260467.

add_victory(‘Rumble’,‘Skarner’,‘Viktor’,‘Ezreal’,‘Leona’,‘Ambessa’,‘Vi’,‘Aurora’,‘Kai'Sa’,‘Rakan’).

load_matrix(‘matrix.txt’,Matrix),win_proba_draft(‘Jayce’,‘Brand’,‘Yone’,‘Varus’,‘Nautilus’,‘Sion’,‘Sejuani’,‘Taliyah’,‘Miss
Fortune’,‘Rell’,Matrix,P). Matrix = [[0, 0, 0, 0, 0, 0, 0, 0|...], [0, 0, 0, 0, 0, 0, 0|...], [0, 0, 0, 0, 0, 0|...], [0, 0,
0, 0, 0|...], [0, 0, 0, 0|...], [0, 0, 0|...], [0, 0|...], [0|...], [...|...]|...], P = 0.5133301737382324.

add_victory(‘Sion’,‘Sejuani’,‘Taliyah’,‘Miss Fortune’,‘Rell’,‘Jayce’,‘Brand’,‘Yone’,‘Varus’,‘Nautilus’).

2.4. TES - TL

load_matrix(‘matrix.txt’,Matrix),win_proba_draft(‘Rumble’,‘Vi’,‘Aurora’,‘Ashe’,‘Braum’,‘Galio’,‘Xin
Zhao’,‘Tristana’,‘Ezreal’,‘Rakan’,Matrix,P). Matrix = [[0, 0, 0, 0, 0, 0, 0, 0|...], [0, 0, 0, 0, 0, 0, 0|...], [0, 0,
0, 0, 0, 0|...], [0, 0, 0, 0, 0|...], [0, 0, 0, 0|...], [0, 0, 0|...], [0, 0|...], [0|...], [...|...]|...], P =
0.46892897678537176.
add_victory(‘Rumble’,‘Vi’,‘Aurora’,‘Ashe’,‘Braum’,‘Galio’,‘Xin Zhao’,‘Tristana’,‘Ezreal’,‘Rakan’).

load_matrix(‘matrix.txt’,Matrix),win_proba_draft(‘K'Sante’,‘Maokai’,‘Hwei’,‘Kalista’,‘Nautilus’,‘Aatrox’,‘Pantheon’,‘Sylas
Matrix = [[0, 0, 0, 0, 0, 0, 0, 0|...], [0, 0, 0, 0, 0, 0, 0|...], [0, 0, 0, 0, 0, 0|...], [0, 0, 0, 0, 0|...], [0, 0, 0, 0|...],
[0, 0, 0|...], [0, 0|...], [0|...], [...|...]|...], P = 0.49222284950490025.
add_victory(‘Aatrox’,‘Pantheon’,‘Sylas’,‘Varus’,‘Neeko’,‘K'Sante’,‘Maokai’,‘Hwei’,‘Kalista’,‘Nautilus’).

2.5. HLE - CBO

load_matrix(‘matrix.txt’,Matrix),win_proba_draft(‘Rumble’,‘Vi’,‘Yone’,‘Ashe’,‘Rakan’,‘Karma’,‘Wukong’,‘Azir’,‘Ezreal’,‘Al
Matrix = [[0, 0, 0, 0, 0, 0, 0, 0|...], [0, 0, 0, 0, 0, 0, 0|...], [0, 0, 0, 0, 0, 0|...], [0, 0, 0, 0, 0|...], [0, 0, 0, 0|...],
[0, 0, 0|...], [0, 0|...], [0|...], [...|...]|...], P = 0.4553966612109141.

add_victory(‘Rumble’,‘Vi’,‘Yone’,‘Ashe’,‘Rakan’,‘Karma’,‘Wukong’,‘Azir’,‘Ezreal’,‘Alistar’).

load_matrix(‘matrix.txt’,Matrix),win_proba_draft(‘Vladimir’,‘Nidalee’,‘Zed’,‘Miss
Fortune’,‘Rell’,‘Gragas’,‘Kindred’,‘Taliyah’,‘Corki’,‘Leona’,Matrix,P). Matrix = [[0, 0, 0, 0, 0, 0, 0, 0|...],
[0, 0, 0, 0, 0, 0, 0|...], [0, 0, 0, 0, 0, 0|...], [0, 0, 0, 0, 0|...], [0, 0, 0, 0|...], [0, 0, 0|...], [0, 0|...], [0|...],
[...|...]|...], P = 0.51499550161941.

add_victory(‘Vladimir’,‘Nidalee’,‘Zed’,‘Miss Fortune’,‘Rell’,‘Gragas’,‘Kindred’,‘Taliyah’,‘Corki’,‘Leona’).

2.6. TES - KC

load_matrix(‘matrix.txt’,Matrix),win_proba_draft(‘Ambessa’,‘Viego’,‘Aurora’,‘Kalista’,‘Renata
Glasc’,‘Jayce’,‘Skarner’,‘Taliyah’,‘Ashe’,‘Karma’,Matrix,P). Matrix = [[0, 0, 0, 0, 0, 0, 0, 0|...], [0, 0, 0, 0, 0,

0, 0|...], [0, 0, 0, 0, 0, 0|...], [0, 0, 0, 0, 0|...], [0, 0, 0, 0|...], [0, 0, 0|...], [0, 0|...], [0|...], [...|...]|...], P = 0.46588641397664204.

add_victory('Jayce','Skarner','Taliyah','Ashe','Karma','Ambessa','Viego','Aurora','Kalista','Renata Glasc').

load_matrix('matrix.txt',Matrix),win_proba_draft('Gnar','Karthus','Corki','Varus','Rell','Aatrox','Ivern','Yone','Ezreal','Le
Matrix = [[0, 0, 0, 0, 0, 0, 0, 0|...], [0, 0, 0, 0, 0, 0, 0|...], [0, 0, 0, 0, 0, 0|...], [0, 0, 0, 0, 0|...], [0, 0, 0, 0|...], [0, 0, 0|...], [0, 0|...], [0|...], [...|...]|...], P = 0.5036110483266414.

add_victory('Aatrox','Ivern','Yone','Ezreal','Leona','Gnar','Karthus','Corki','Varus','Rell').

3. Result and conclusion