

# Draft Analyser

## 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  $(i, j) \in \llbracket 1; 170 \rrbracket^2$ , 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  $D$  :

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

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  $B$ :

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

And finally 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 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  $i \in \llbracket 1, 5 \rrbracket$ .
- $\frac{1}{3}$  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).

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').

first test :

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|...], [0, 0|...], [0|...], [...|...]|...], P = 0.47834688488309984.

wrong result

add\_victory('Jax','Skarner','Azir','Ezreal','Alistar','Kennen','Vi','Aurora','Miss Fortune','Leona').

## 3. Result and conclusion