

## 1 just some thoughts

Let's say engine  $A$  plays  $n \geq 1$  games against engine  $B$  and scores  $+w, = d, -l$ , where  $w$  = number of wins,  $d$  = number of draws and  $l$  = number of losses, with  $w + d + l = n$ .

Then we may assume the expected score of  $A$  against  $B$  to be normally distributed around the mean

$$\mu = \frac{w}{n} + \frac{d}{2n} \text{ (win rate + half the draw rate),}$$

with 'small variance', if  $n$  is high, or 'larger variance' if not many games have been played. For example, let's use  $\sigma = \frac{1000}{n}$  (?):

$$E_A \sim \mathcal{N}\left(\frac{w}{n} + \frac{d}{2n}, \frac{1000}{n}\right).$$

Given  $E_A$ , the rating difference  $R_B - R_A$  can be calculated to be

$$R_B - R_A = \frac{400 \ln(\frac{1}{E_A} - 1)}{\ln(10)}.$$

So the rating difference is a random variable that we expect to be around  $\frac{400 \ln(\frac{1}{\mu} - 1)}{\ln(10)}$  (?)

Our goal is to somehow set up the prior (=our initial belief, what we think the ratings are according to the data from the .csv-file) where the ratings are centered around 2000, using STAN ...