A bayesian rating method to predict (professional) tennis matches

Introduction

To

Common Opponent Models

This method’s goal is to use the most recent matches (e.g. 12 months) and calculate the performance metrics such as “proportion of points won on serve” to predict the probability that player i wins versus player j. This could cause problems, if both players played versus opponents of different strengths. Therefore a subset of the matches is used, only opponents where both players played versus each other. Because the top players often play versus each other this method is applicable in tennis. (Knottenbelt et al 2012).

Bayesian Rating Systems:

Elo

Arpad Elo created a rating system for the USCF (United States Chess Federation) based on the normal distribution. The assumption is that each game is distributed in the following manner: pi ~ N(pi; si, β2). This results in an expectation for player 1 of:

E(w1) = P(p1 > p2 | s1, s2) =

To update the ratings of the players the following rule is used:

newRatingPlayer1 = oldRatingPlayer1 + k \* (result - E(w1))  
newRatingPlayer2 = oldRatingPlayer2 + k \* (result – E(w2))

where the k-factor decides the relevance of one game played.

Glicko  
  
Mark Glickman makes use of an unique standard deviation for each player, making the result dependent on both the players skill levels and the players standard deviations. A player’s standard deviation increases when he doesn’t play any games and decreases for each game played.

TrueSkill  
  
TrueSkill works in a similar manner as the the other two models, but explicitly models draws and can be used for team games.

The Tennis Dataset

The data is taken from [www.github.com/JeffSackmann/tennis\_atp](http://www.github.com/JeffSackmann/tennis_atp), which contains ATP matches starting from January 1968 up to 11 september 2017. Only the matches from January 2000 up to December 2016 are taken. In total there are 53508 ATP matches in this period. This data contains all sorts of match statistics. But does not contain the day the match is played, nor betting odds. Therefore I join the data at [www.tennis-data.co.uk](http://www.tennis-data.co.uk) to add these variables. After this step only 46780 matches are left, but these matches are double checked for accuracy. Since matches on carpet have not been played since 2009, these matches are also removed resulting in a database with 45104 matches.

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| --- | --- | --- | --- |
| Surface | Clay | Grass | Hard |
| matches | 15347 | 5189 | 24568 |

Bibliography:  
Knottenbelt, W. J., D. Spanias, and A. M. Madurska. 2012. “A Common-

Opponent Stochastic Model for Predicting the Outcome of

Professional Tennis Matches.” *Computers & Mathematics with*

*Applications* 64(12):3820–3827.