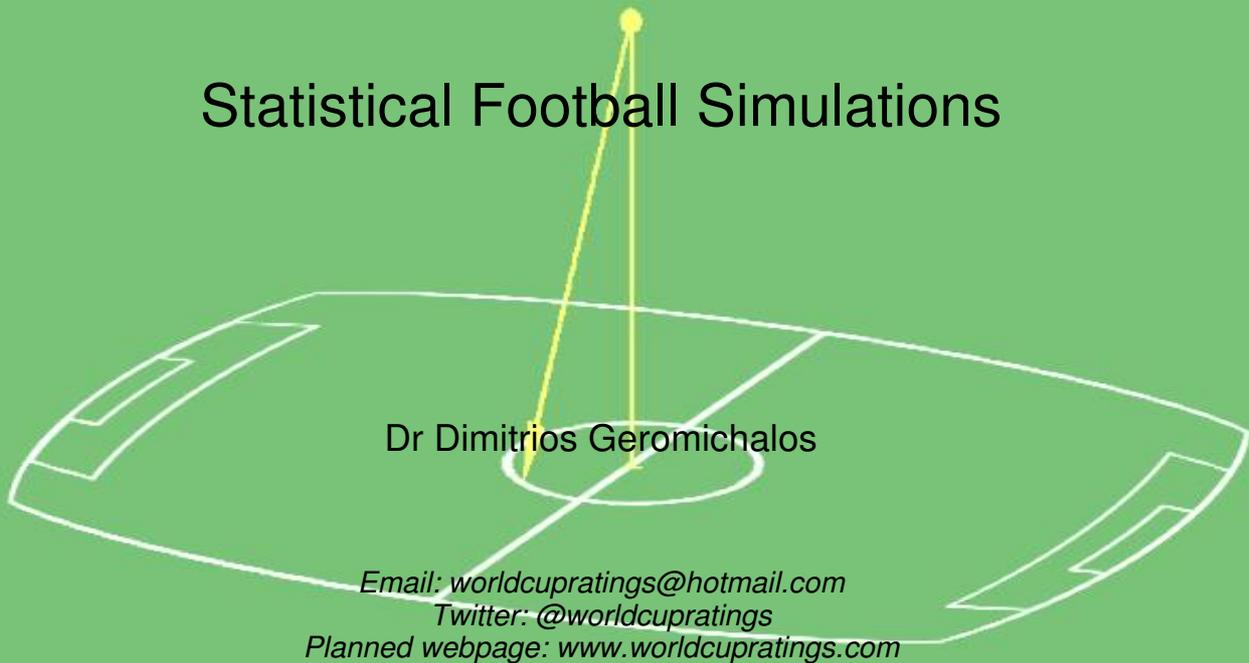


# World Cup Ratings

## Statistical Football Simulations



## Idea

- PC simulation program for every interested user
  - Open Source under 4-clause BSD license
- Calculation of soccer result probabilities
- Consideration of all possible combinations
- Updates after each playing day
- Analysis of fictive scenarios
  - Better judgement of probable or improbable events
  - Unprecedented view on sports results

# Features

- **Modules**
  - *World Cups*
  - *European Cups*
  - *National Leagues* (Bundesliga,...)
  - *Auxiliary Functions* (single plays, Elo numbers,...)
- Graphical display of results
- User-friendly interface
- Detailed documentation and help

# Methods

- Elo coefficients
- Combinatorics
- Probability calculations
- Monte Carlo simulations
- Football-specific statistical models
- Real results as parameters
  - Statistical analysis of all possible paths

# Start Page and Simple Functions

The screenshot displays three overlapping windows from the WorldCupRatings application:

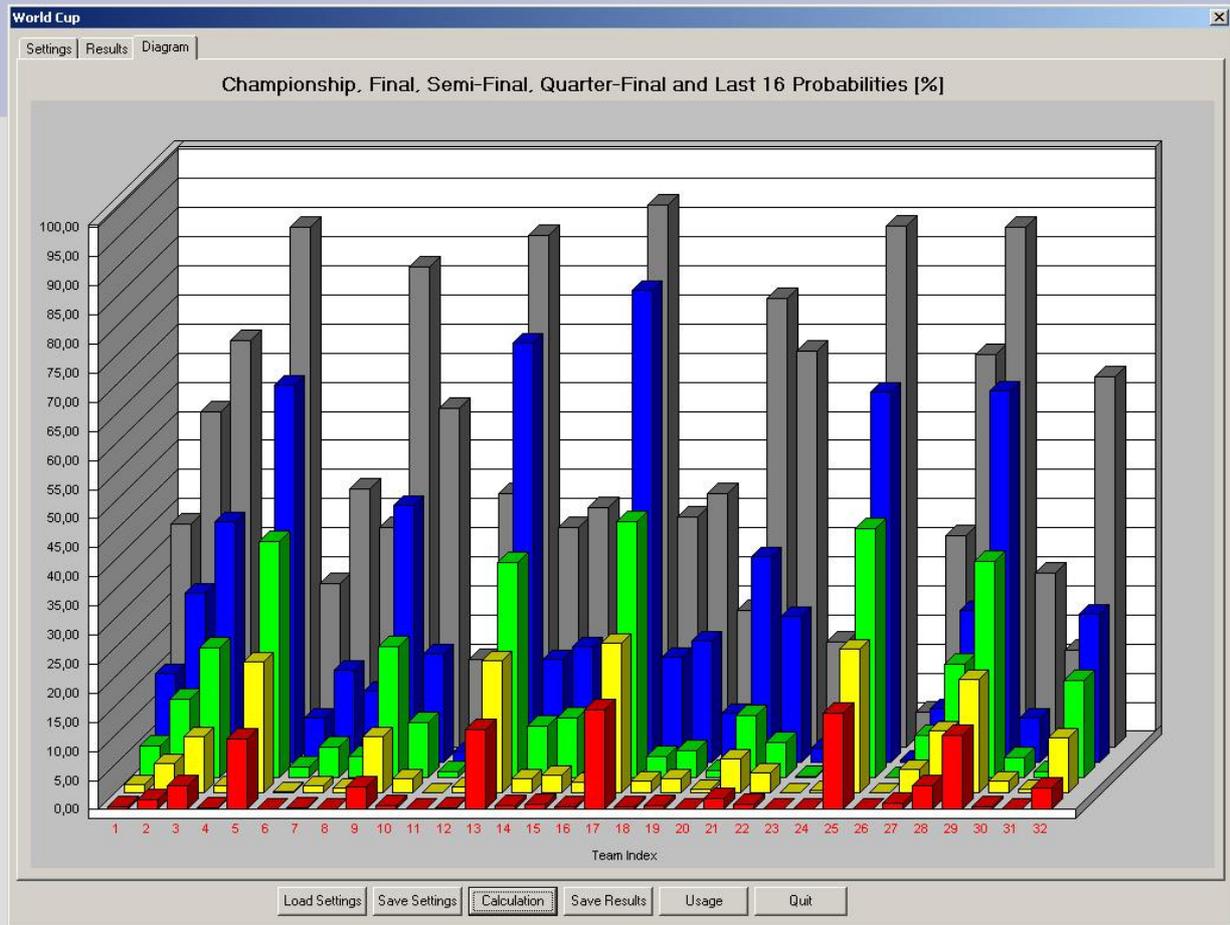
- Quota Calculator:** Shows input for Win Probability [%] (28) and Odd Quota (2.6). Buttons include Calc. Quota, Calc. Prob., Usage, and Quit.
- Single Play Result:** Shows a match between Argentina (Elo 1984) and Brazil (Elo 2016). It displays calculated probabilities: Win Probability Team 1 [%] (27.24), Remis Probability [%] (36.33), and Win Probability Team 2 [%] (36.43). A vertical bar chart on the right shows probability distribution from 0,00 to 90,00.
- Elo Coefficient Calculator:** Shows match details for Team 1 (Argentina, Elo 1997) and Team 2 (Brazil, Elo 2015). It includes a dropdown for 'Type of Match' (World Cup / continental qualifier or major tournament), a 'Result' dropdown (Win Team 2), and a 'Goal Difference' input (1). It calculates a 'New Elo Number' for Team 1 (1972) and Team 2 (2040).

# World Cup: Inputs

The screenshot shows the main 'World Cup' interface with the following sections:

- Team List:** A table listing teams grouped by letter (A-H) with columns for Elo, Home advantage, and Prelim. Rank.
- Preliminaries Results:** A grid of match results for groups A through H, with options for 'Not played' or specific scores.
- Quarter-Finals (set?, Team 1, Team 2):** Four rows for quarter-final matches, each with checkboxes and input fields for team names and scores.
- Semi-Finals (set?, Team 1, Team 2):** Two rows for semi-final matches, each with checkboxes and input fields.
- Final (set?, Team 1, Team 2):** One row for the final match with checkboxes and input fields.
- 3rd Place (set?, Team 1, Team 2):** One row for the 3rd place match with checkboxes and input fields.
- Navigation:** Buttons at the bottom for Load Settings, Save Settings, Calculation, Save Results, Usage, and Quit.

# World Cup: Results



# Bundesliga: Inputs

National League

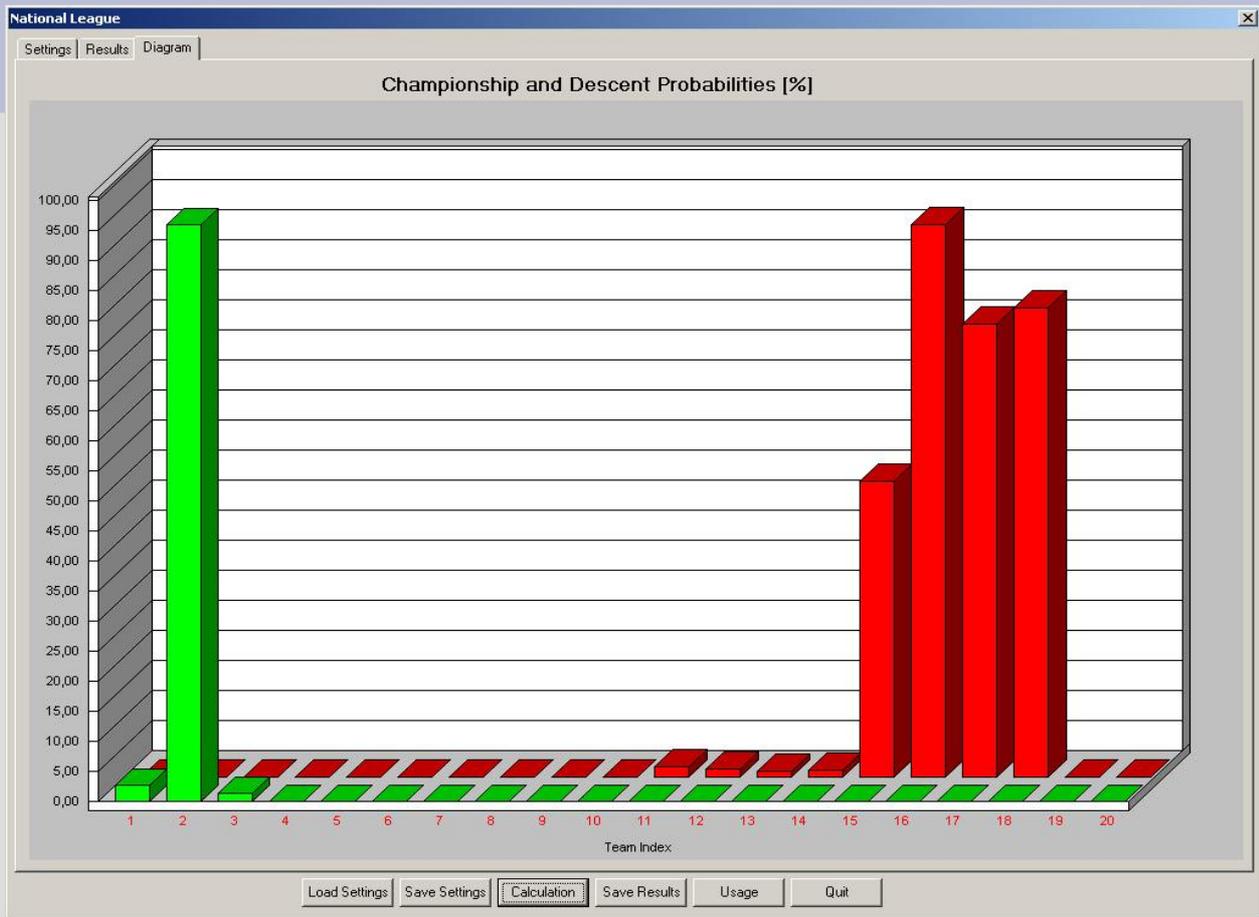
Settings | Results | Diagram

League  
Bundesliga

Team	Elo Number	Already Played (Row: Home Play)																				Current Points
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
FC Bayern Muenchen	1493	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	29								
Borussia Dortmund	1474	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	43
Bayer 04 Leverkusen	1420	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	33
TSG 1899 Hoffenheim	1348	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	25
FC Schalke 04	1343	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	22
Eintracht Frankfurt	1319	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	26
FSV Mainz 05	1286	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	33
Hannover 96	1261	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	31
Hamburger SV	1256	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	24
SC Freiburg	1236	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	28
Werder Bremen	1229	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	19							
VfL Wolfsburg	1228	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	19
1. FC Kaiserslautern	1197	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	21
1. FC Nuernberg	1181	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	22
VfB Stuttgart	1179	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	12
Borussia Moenchengladb	1116	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	10
1. FC Koeln	1074	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	15
FC St. Pauli	1020	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	17
n/a	n/a	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	n/a								
n/a	n/a	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	n/a								

Load Settings Save Settings Calculation Save Results Usage Quit

# Bundesliga: Results



# Help Screens

**Introduction**

Of course no one can pre...  
Nonetheless, the overwh...  
This answer is well-found...  
Mathematically a team's s...  
determine the expected r...

However, when it comes...  
significant role. Teams th...  
teams in easier groups mi...  
consideration.

A similar problem arises fo...  
Exactly this is the main so...

The program consists of s...  
In the World Cup module...  
results. The results one g...  
final and get the World C...  
The European Cup modu...  
In the League module, pr...  
probabilities are calculate...  
Some minor modules perf...

Each module can be call...  
"Usage" button exists for...

It should be mention th...  
the latter may be difficult...  
the German Bundesliga.  
Feel free to support the id...

**World Cup**

Preliminary Round

General Points

In a World Cup each one of the...  
ones reach the round of the last...  
A1 - B2 and A2 - B1  
C1 - D2 and C2 - D1  
E1 - F2 and E2 - F1  
G1 - H2 and G2 - H1

Group Leaders

As a next step, the probability of...  
Preliminary\_First(G, a, b).  
World Cup Ratings considers all...  
In this, only victory/defeat is tak...  
All in all, there are 12 probabilitie...

Last Sixteen Combinations

The probability of a last sixteen...  
Last\_sixteen\_Combination(A1 - ...  
= Preliminary\_First(A, a, b) \* Prel...

There are 144 scenarios each f...

Group Scenarios

In many cases the only thing th...  
other ones. In this case, "equal...  
this, all possible 297 combinatio...  
Group scenarios are also create...

KO Round

The Quarter-Final

In the 4 quarter finals the winner...

W(A1 - B2) - W(C1 - D2)  
W(E1 - F2) - W(G1 - H2)  
W(A3 - B3) - W(C3 - D3)

**National League**

In comparison to a World Cup or European Cup, at the first glance a national league championship is relatively simple: There are no complicated preliminary rules or "tournament trees" and the next play opponents are known.  
On the other hand, the high number of possible play results (up to 3^380) makes an analytical calculation of each possibility - at least for a PC of the year 2010 - impossible.  
Hence, a Monte Carlo simulation approach was chosen:  
In a single scenario, random numbers between 0 and 1 are assigned to each still open play. According to the Elo probability, points are assigned as follows:

3 points, if the random number is smaller than the Elo win probability  
1 point, if the random number is bigger than the Elo win, but smaller than the sum of the win and the remis probability  
0 points else

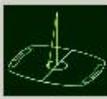
In order to reach stable results, 200000 scenarios are calculated and the mean probabilities are chosen. That's why the calculation may last some seconds at the current level of technology...

Currently, the League module of World Cup Ratings calculates the probabilities for the Championship, the reach of a place in the Champions League and the Europe League (UEFA Cup) as well as the descent probabilities.  
The following leagues with the following characteristics are considered at the moment:

English Premier League: 20 teams, 4 Champions League places, 4 UEFA Cup places  
German Bundesliga: 18 teams, 4 Champions League places, 4 UEFA Cup places  
Italian Serie A: 20 teams, 4 Champions League places, 3 UEFA Cup places  
Spanish Primera Division: 20 teams, 4 Champions League places, 4 UEFA Cup places

Unfortunately, reliable Elo coefficients only for the German Bundesliga are available.

**About World Cup Ratings**

 World Cup Ratings  
Version 2.0

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OK