Predicting the potential of professional soccer players

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MLSA17 @ ECML/PKDD17
18/09/2017

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Meet Bob, a young professional soccer player

Bob
Age: 19
Year: 2017

Bob has a set of skill ratings

Bob

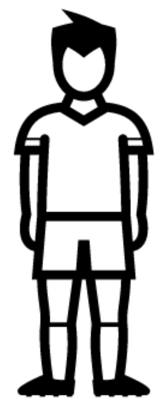
Age: 19

Year: 2017

Attacking: 75/100
Defending: 67/100
Stamina: 50/100
Intelligence: 72/100

Meet Bob from the future

Bob
Age: 19
Year: 2017



Bob
Age: 21
Year: 2019

Attacking: 75/100
Defending: 67/100
Stamina: 50/100
Intelligence: 72/100

What are his skill ratings?

Bob
Age: 19
Year: 2017

Bob
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Attacking: 75/100
Defending: 67/100
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Attacking: ?/100
Defending: ?/100
Stamina: ?/100
Intelligence: ?/100

Overview

Related Work
PECOTA and CARMELO

Data
SoFIFA.com ratings

APROPOS
Our approach for predicting players’ potential

Experiments
Evaluating the predictive accuracy

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Similar systems have already been deployed in baseball (1) and basketball (2)

(1) PECOTA

Player Empirical Comparison Analysis Test Algorithm

Nearest neighbors analysis on player statistics
using Bill James's similarity scores

(2) CARMELO

Career-Arc Regression Model Estimator
with Local Optimization

Nearest neighbors analysis
on Wins Above Replacement (WAR)
using simple similarity score

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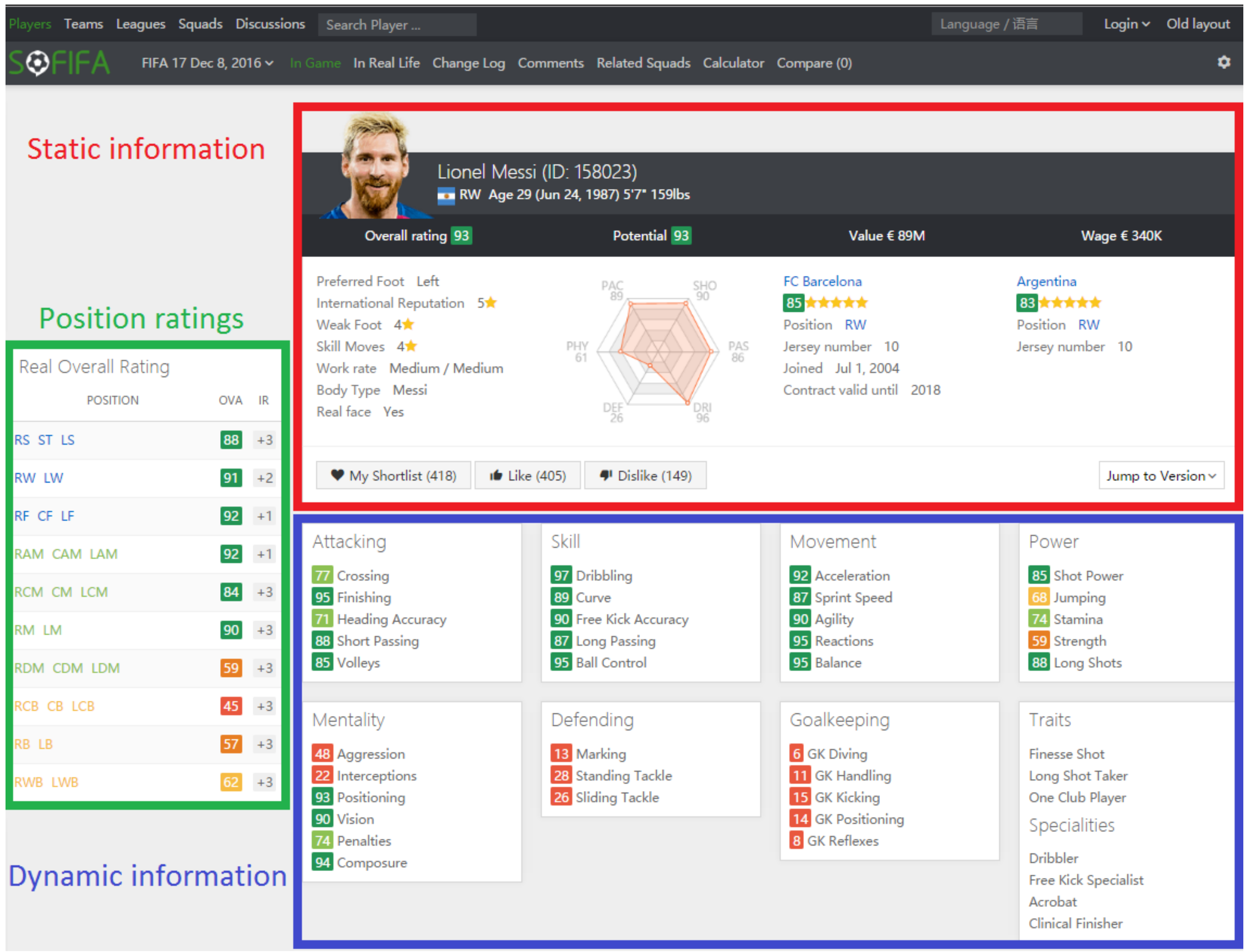
A player card from SoFIFA.com contains 24 skill ratings for a specific player and age



The data

Competitions:

England, France, Germany, Italy and Spain

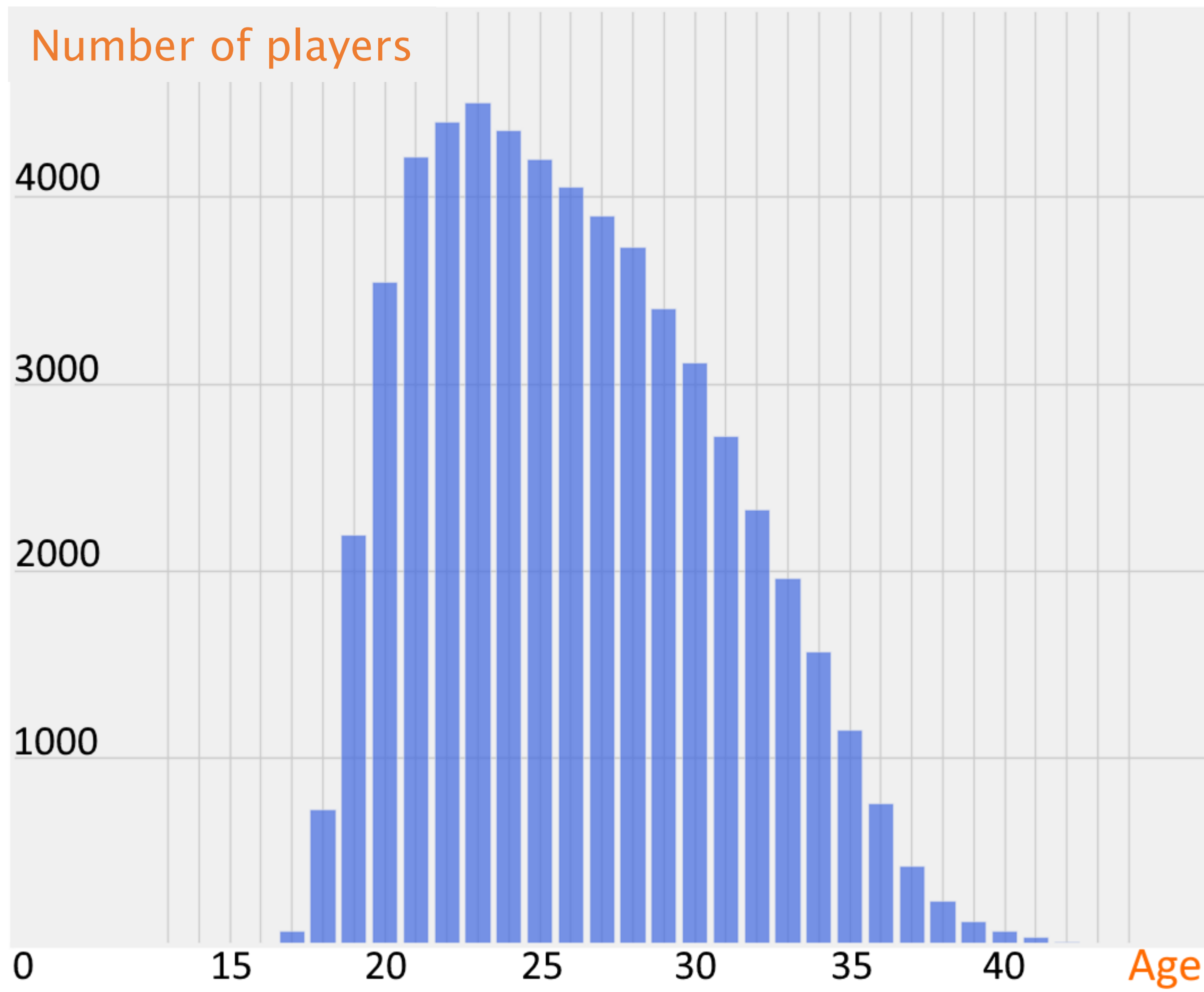
Stats:

- 10,000 players
- 57,000 player cards
- Data from 2007-2017

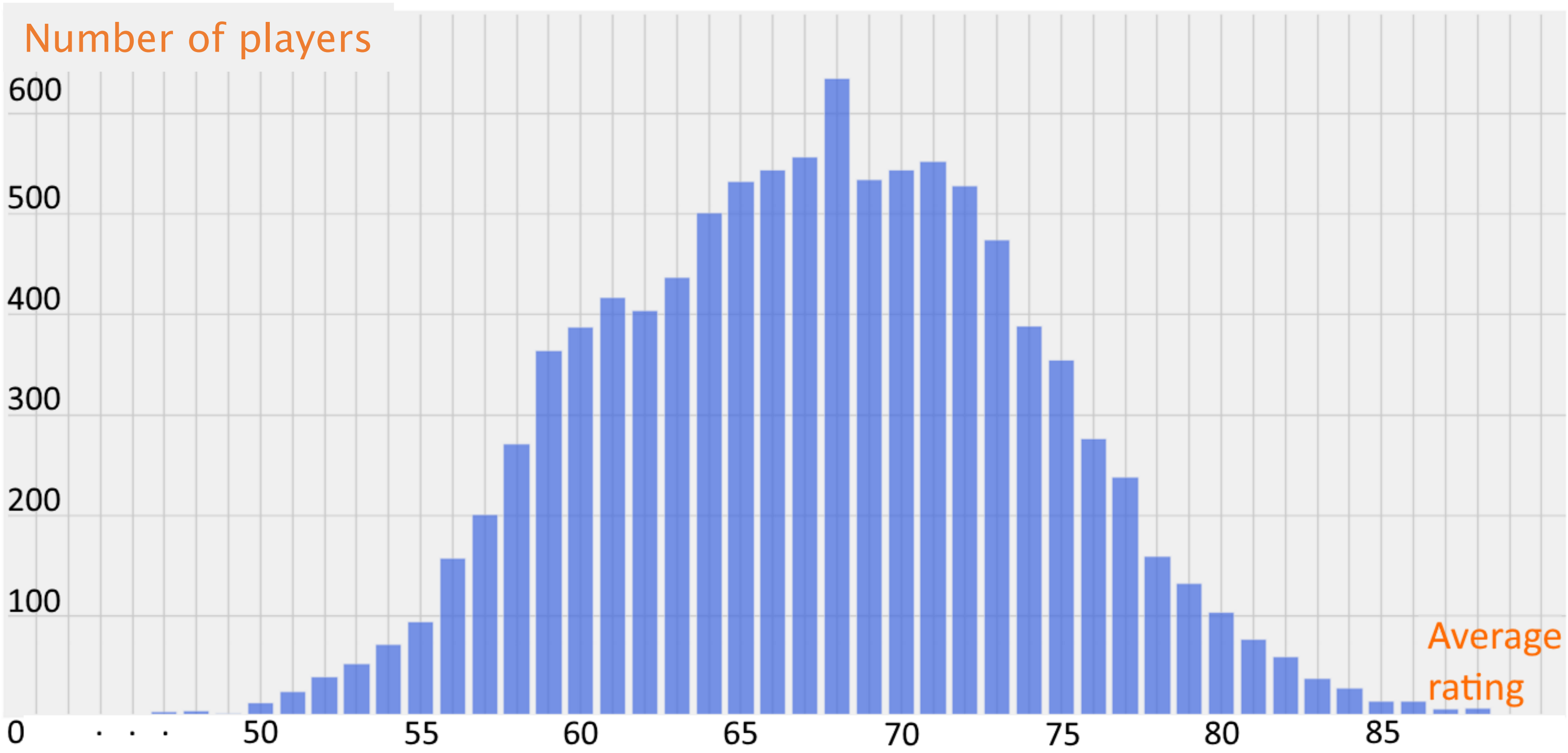
Preprocessing challenges:

- Incorrect or missing age
- Position of substitute players

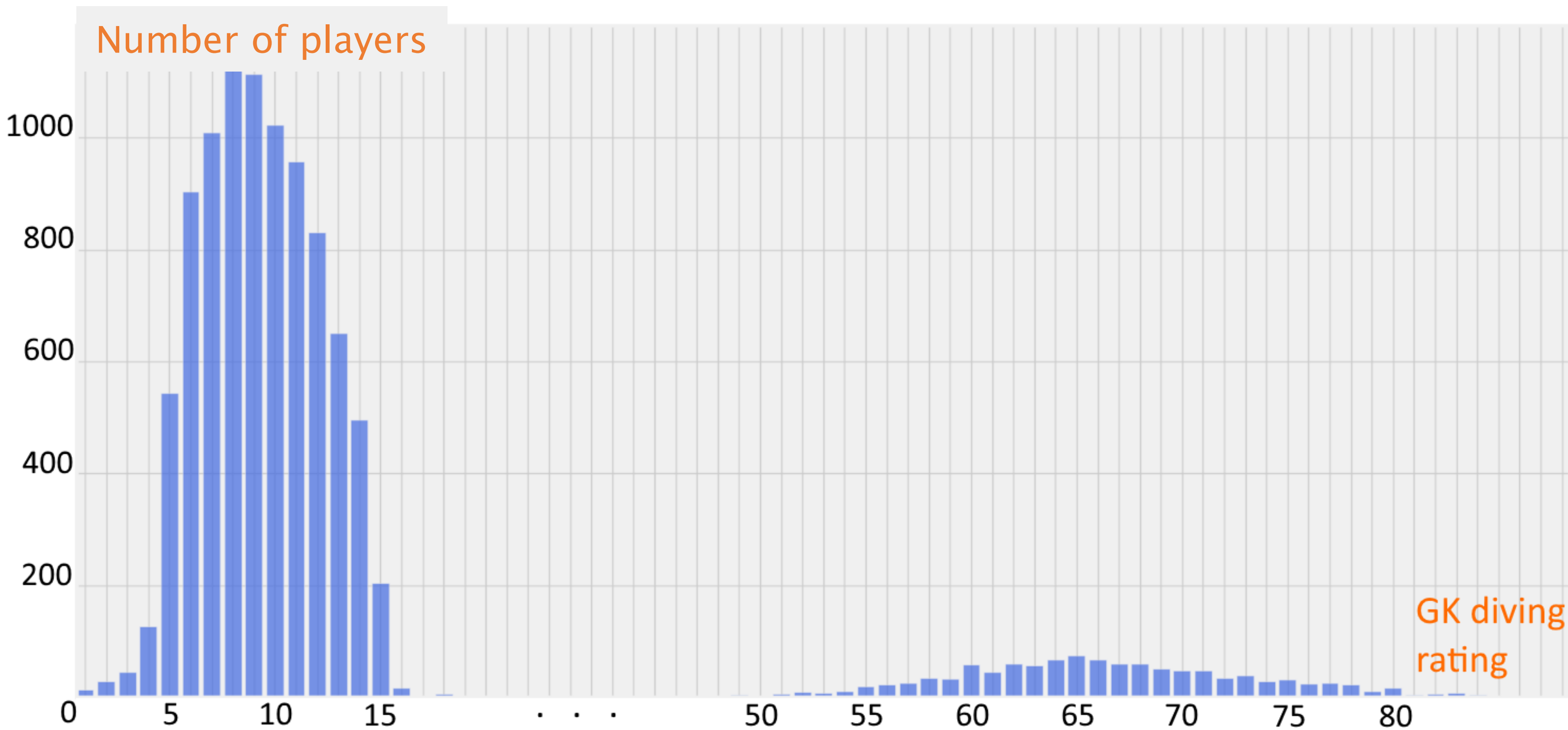
The most interesting categories (young and old players) have the least available data



Most skill ratings follow a normal distribution…



… except goalkeeping skills



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Reminder: our task is to predict the skill ratings of future Bob

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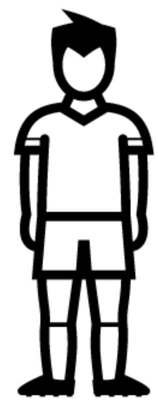
Year: 2017



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Attacking: ?/100
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Stamina: ?/100
Intelligence: ?/100

APROPOS follows a nearest neighbors approach

Given:

- a player p and his current age a_1
- a future age a_2
- a database of players D

Then:

1. Search players in D that are similar to p at age a_1 and have data available for age a_2.
2. Predict the rating of p at age a_2 by combining the ratings of similar players at age a_2.

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   similar to p ... and
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Prediction method

2. Predict the rati of p at age a_2 by
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APROPOS follows a nearest neighbors approach

Given:

- a player p and his current age a_1
- a future age a_2
- a database of players D

Then:

Similarity score — **Absolute** / **Evolutional**

1. Search pl ers in D that are similar to p at age a_1 and have data

Prediction method — **Absolute** / **Evolutional**

2. Predict the rati of p at age a_2 by combining the ratings of similar players at age a_2.

The absolute similarity score expresses the difference between skill ratings

	Bob			Alice		
Age	17	18	19	17	18	19
Dribbling score	68	72	78	81	82	85

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	Bob			Alice		
Age	17	18	19	17	18	19
Dribbling score	68	72	78	81	82	85

$$f(\text{Bob}, \text{Alice}) = \sqrt{(68 - 81)^2}$$

The absolute similarity score expresses the difference between skill ratings

	Bob			Alice		
Age	17	18	19	17	18	19
Dribbling score	68	72	78	81	82	85

$$f(\text{Bob}, \text{Alice}) = \sqrt{(68 - 81)^2 + (72 - 81)^2}$$

The absolute similarity score expresses the difference between skill ratings

	Bob			Alice		
Age	17	18	19	17	18	19
Dribbling score	68	72	78	81	82	85

$$f(\text{Bob}, \text{Alice}) = \sqrt{(68 - 81)^2 + (72 - 81)^2 + (78 - 85)^2}$$

The evolutional similarity score expresses the difference between skill evolution

	Bob			Alice		
Age	17	18	19	17	18	19
Dribbling score	68	72	78	81	82	85

The evolutional similarity score expresses the difference between skill evolution

	Bob			Alice		
Age	17	18	19	17	18	19
Dribbling score	68	72	78	81	82	85

+4 +6 +1 +3

The evolutional similarity score expresses the difference between skill evolution

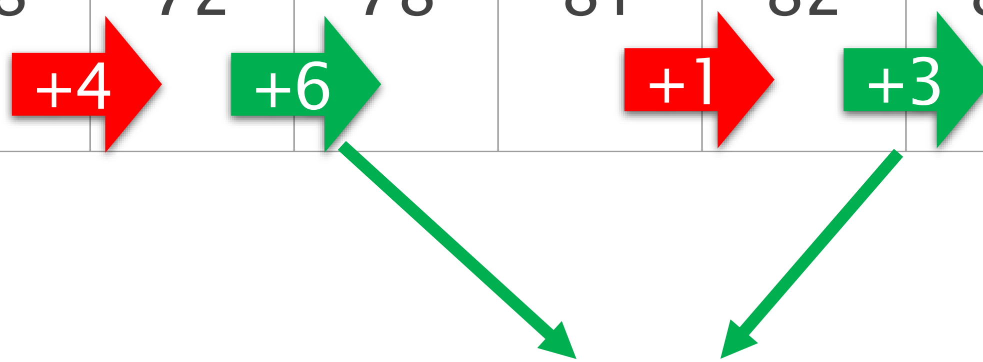
	Bob			Alice		
Age	17	18	19	17	18	19
Dribbling score	68	72	78	81	82	85

+4 +6 +1 +3

$$f(\text{Bob}, \text{Alice}) = \sqrt{(4-1)^2}$$

The evolutional similarity score expresses the difference between skill evolution

	Bob			Alice		
Age	17	18	19	17	18	19
Dribbling score	68	72	78	81	82	85



$$f(\text{Bob}, \text{Alice}) = \sqrt{(4-1)^2 + (1-3)^2}$$

The similarity score between players is computed as the average over all skills

$$sim(p, p') = \frac{\sum_{v \in V} sim_v(p, p')}{|V|}$$

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Total similarity between 2 players

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Normalized similarity per skill (e.g. dribbling)

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The similarity score between players is computed as the average over all skills

Total similarity between 2 players

Normalized similarity per skill (e.g. dribbling)

$$sim(p, p') = \frac{\sum_{v \in V} sim_v(p, p')}{|V|}$$

Total number of skills (=24)

APROPOS follows a nearest neighbors approach

Given:

- a player p and his current age a_1
- a future age a_2
- a database of players D

Similarity score
- Absolute
- Evolutional

Then:

1. Search pl ers in D that are similar to and have data
2. Predict the rati of p at age a_2 by combining the player ratings at age a_2.

Prediction method
- Absolute
- Evolutional

We want to predict Bob's dribbling rating at age 21

	Bob	
Age	19	21
Dribbling	78	?

Alice is a similar player to Bob for whom we have historical data

	Bob		Alice	
Age	19	21	19	21
Dribbling	78	?	85	86

$$Sim(Bob, Alice) = 0.7$$

Eve is also a similar player to Bob for whom we have historical data

	Bob		Alice		Eve	
Age	19	21	19	21	19	21
Dribbling	78	?	85	86	64	75

$Sim(Bob, Alice) = 0.7$ $Sim(Bob, Eve) = 0.8$

The absolute prediction method uses the skill ratings of similar players

	Bob		Alice		Eve	
Age	19	21	19	21	19	21
Dribbling	78	?	85	86	64	75

$Sim(Bob, Alice) = 0.7$ $Sim(Bob, Eve) = 0.8$

The absolute prediction method uses the skill ratings of similar players

	Bob		Alice		Eve	
Age	19	21	19	21	19	21
Dribbling	78	?	85	86	64	75

$Sim(Bob, Alice) = 0.7$ $Sim(Bob, Eve) = 0.8$

$Dribbling\ prediction = \_\_\_\_\_\_\_\_\_\_\_\_\_\_$

The absolute prediction method uses the skill ratings of similar players

	Bob		Alice		Eve	
Age	19	21	19	21	19	21
Dribbling	78	?	85	86	64	75

$Sim(Bob, Alice) = 0.7$ $Sim(Bob, Eve) = 0.8$

$$Dribbling\ prediction = \frac{0.7 * 86 + 0.8 * 75}{0.7 + 0.8} = 80$$

The evolutional prediction method uses the skill evolutions of similar players

	Bob		Alice		Eve	
Age	19	21	19	21	19	21
Dribbling	78	?	85	86	64	75

$Sim(Bob, Alice) = 0.7$ $Sim(Bob, Eve) = 0.8$

The evolutional prediction method uses the skill evolutions of similar players

	Bob		Alice		Eve	
Age	19	21	19	21	19	21
Dribbling	78	?	85	86	64	75
			+1		+11	

$Sim(Bob, Alice) = 0.7$ $Sim(Bob, Eve) = 0.8$

The evolutional prediction method uses the skill evolutions of similar players

	Bob		Alice		Eve	
Age	19	21	19	21	19	21
Dribbling	78	?	85	86	64	75

+1 (Alice, 19 → 21) +11 (Eve, 19 → 21)

$Sim(Bob, Alice) = 0.7$ $Sim(Bob, Eve) = 0.8$

$$Dribbling\ prediction = 78 + \underline{\hspace{10em}}$$

The evolutional prediction method uses the skill evolutions of similar players

	Bob		Alice		Eve	
Age	19	21	19	21	19	21
Dribbling	78	?	85	86	64	75

+1

+11

$Sim(Bob, Alice) = 0.7$

$Sim(Bob, Eve) = 0.8$

$$Dribbling\ prediction = 78 + \frac{0.7 * 1 + 0.8 * 11}{0.7 + 0.8} = 84$$

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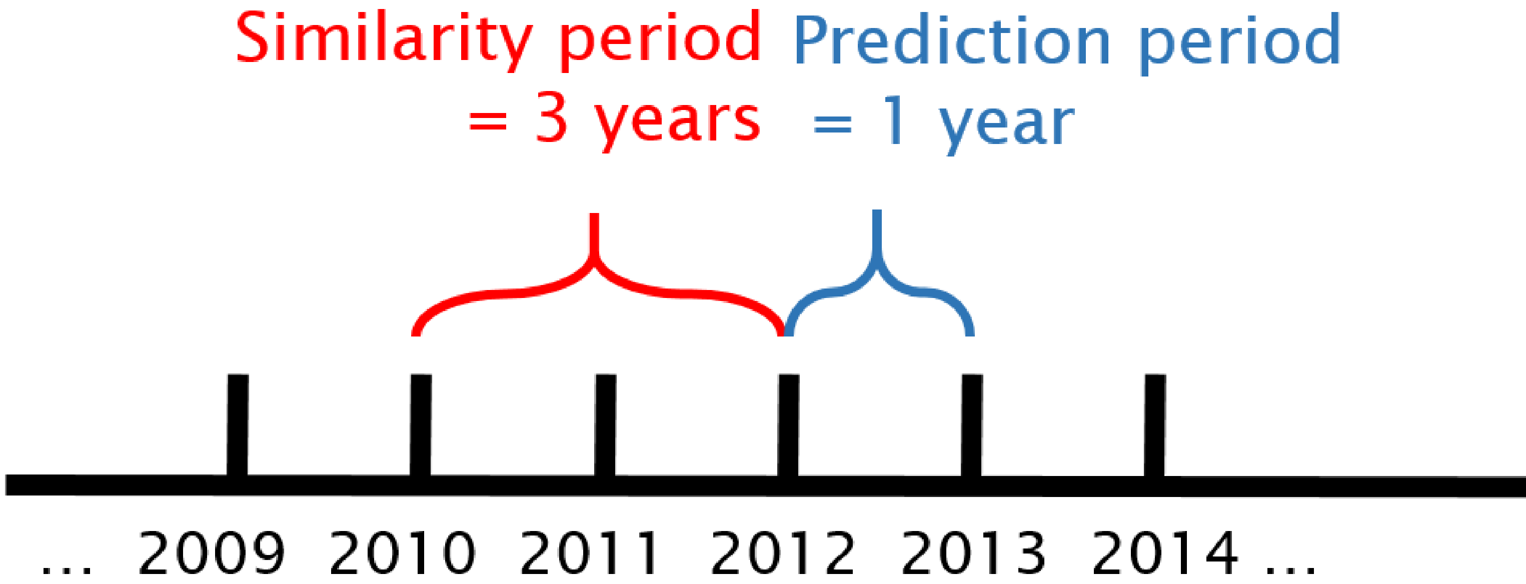
We predict skill ratings
for 1000 players in 2012

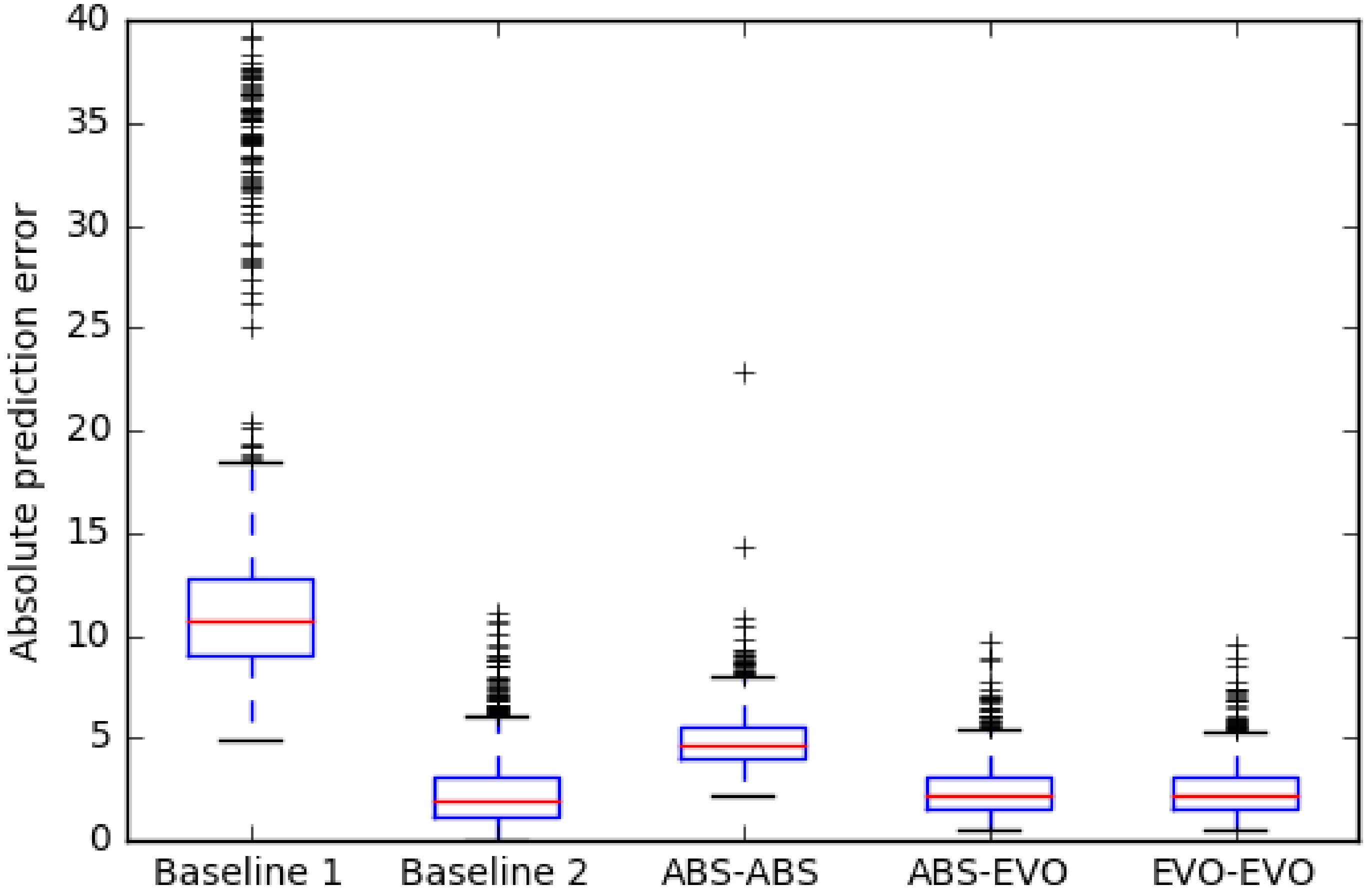


We compare 2 baseline models against 3 instances of APROPOS

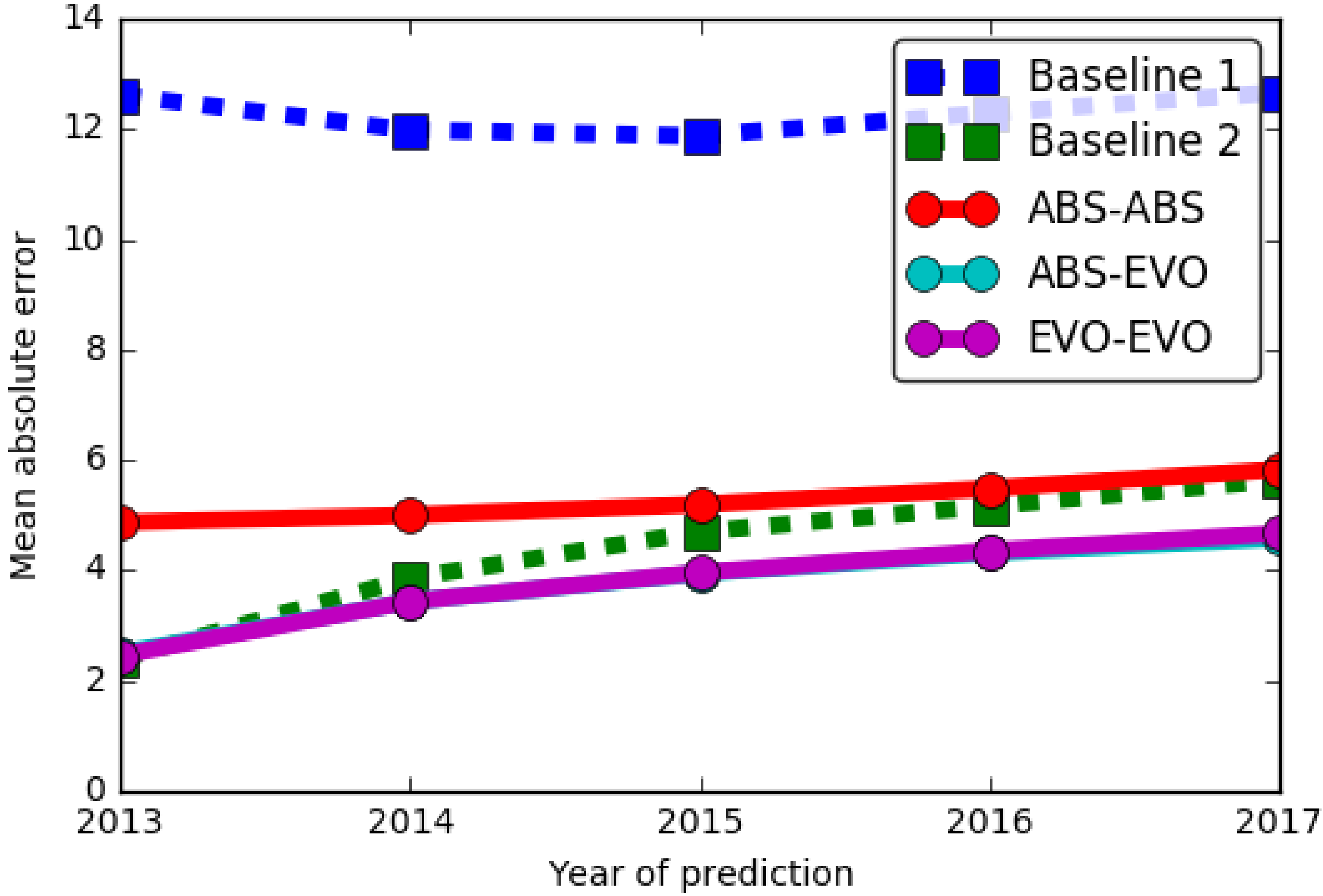
1. Baseline 1: average skill rating of age group
2. Baseline 2: current skill rating as prediction

3. ABS-ABS
4. ABS-EVO
5. EVO-EVO

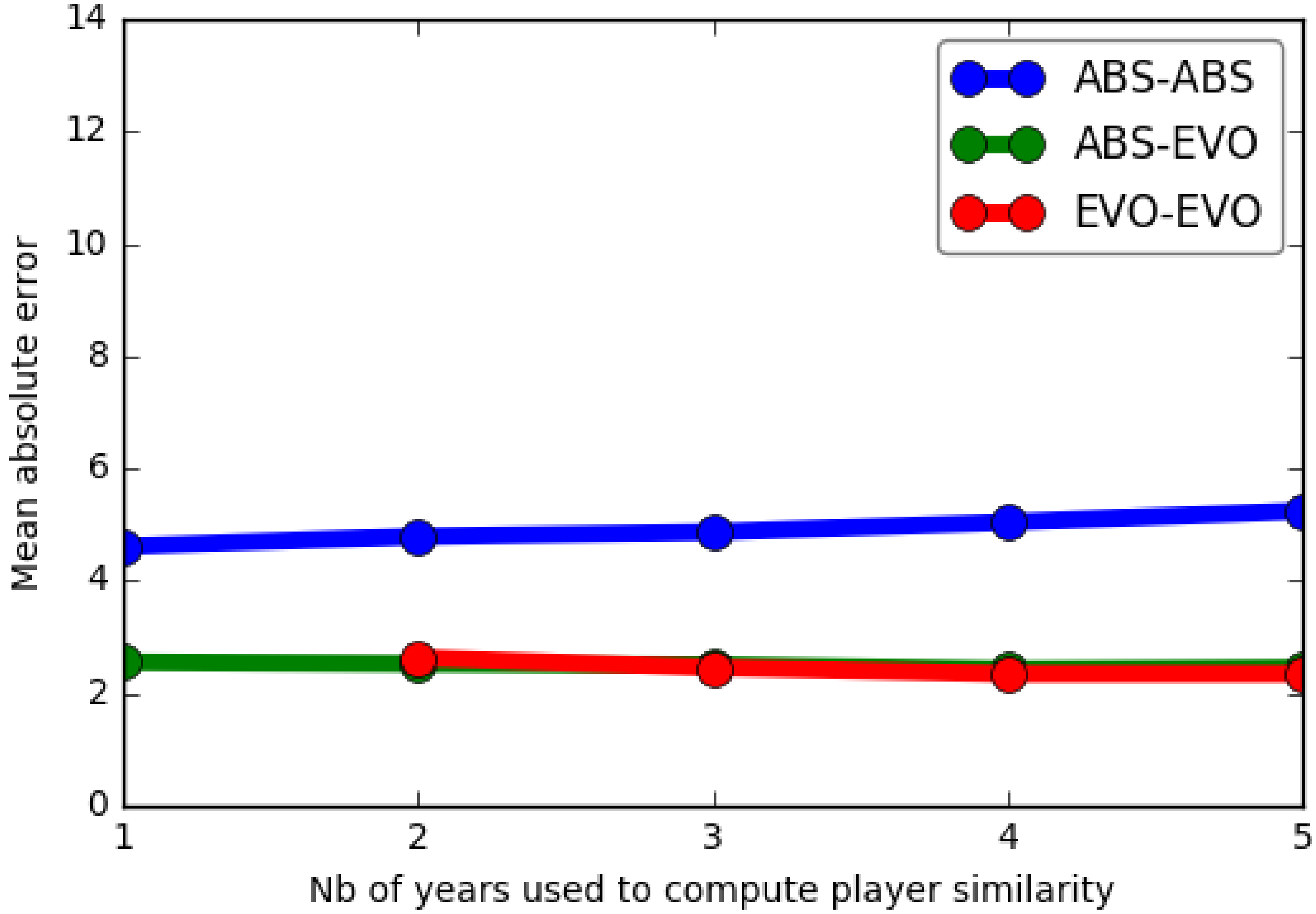
APROPOS performs better than baseline 1 and roughly equal to baseline 2.



APROPOS beats Baseline 2 when predicting farther in the future



The nb of years used to compute player similarity has little effect on performance



Conclusion

Predicting the potential of professional soccer players is an interesting task.

APROPOS solves this task using a nearest neighbors approach.

The best results are obtained by combining player-specific info with population-based info.