Package ‘BAwiR’

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Type Package
Title Analysis of Basketball Data
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Author Guillermo Vinue
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Description Collection of tools to work with basketball data. Functions available are related to friendly
web scraping and visualization. Data were obtained from <http://www.euroleague.net/>,
<http://www.eurocupbasketball.com/> and <http://www.acb.com>, following the instructions
of their respective robots.txt files, when available. Tools for visualization include a popula-
tion pyramid, 2D plots,
circular plots of players' percentiles, plots of players' monthly/yearly stats,
team heatmaps, team shooting plots, team four factors plots, cross-
tables with the results of regular season games

License GPL (>= 2)

URL https://www.R-project.org, https://www.uv.es/vivigui,
https://www.uv.es/vivigui/AppEuroACB.html

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BAwiR-package

Analysis of Basketball Data

Description

Collection of tools to work with basketball data. Functions available are related to friendly web scraping and visualization. Data were obtained from <http://www.euroleague.net/>, <http://www.eurocupbasketball.com/> and <http://www.acb.com>, following the instructions of their respective robots.txt files, when available. Tools for visualization include a population pyramid, 2D plots, circular plots of players’ percentiles, plots of players’ monthly/yearly stats, team heatmaps, team shooting plots, team four factors plots, cross-tables with the results of regular season games and maps of nationalities. Please see Vinue (2020) <doi:10.1089/big.2018.0124>.

Details

Package: BAwiR
Type: Package
Version: 1.2.3
Date: 2020-04-14
License: GPL-2
LazyLoad: yes
LazyData: yes

acb_players_1718: ACB players 2017-2018.
capit_two_words: Capitalize two-word strings.
do_add_adv_stats: Advanced statistics.
do_EPS: Efficient Points Scored (EPS).
do_four_factors_df: Four factors data frame.
do_join_games_bio: Join games and players’ info.
do_map_nats: Data frame for the nationalities map.
do_scraping_games: Player game finder data.
do_scraping_rosters: Players profile data.
do_stats: Accumulated or average statistics.
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get_barplot_monthly_stats: Barplots with monthly stats.
get_bubble_plot: Basketball bubble plot.
get_four_factors_plot: Four factors plot.
get_games_rosters: Get all games and rosters.
get_heatmap_bb: Basketball heatmap.
get_map_nats: Nationalities map.
get_pop_pyramid: ACB population pyramid.
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join_players_bio_age_acb: Join ACB games and players’ info.
join_players_bio_age_euro: Join Euroleague and Eurocup games and players’ info.
scraping_games_acb: ACB player game finder data.
scraping_games_euro: Euroleague and Eurocup player game finder data.
scraping_rosters_acb: ACB players’ profile.
scraping_rosters_euro: Euroleague and Eurocup players’ profile.

Author(s)
Guillermo Vinue <Guillermo.Vinue@uv.es>

References

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acb_games_1718

**ACB games 2017-2018**

**Description**
Games of the first seventeen days of the ACB 2017-2018 season.

**Usage**

acb_games_1718

**Format**
Data frame with 3939 rows and 38 columns.

**Source**
http://www.acb.com/
**acb_players_1718**  

**ACB players 2017-2018**

**Description**  
Players corresponding to the games of the first seventeen days of the ACB 2017-2018 season.

**Usage**  
acb_players_1718

**Format**  
Data frame with 255 rows and 7 columns.

**Source**  
http://www.acb.com/

**capit_two_words**  
*Capitalize two-word strings*

**Description**  
Ancillary function to capitalize the first letter of both words in a two-word string. This can be used for example to capitalize the teams names for the plots title.

**Usage**  
capit_two_words(two_word_string)

**Arguments**  
two_word_string  
Two-word string.

**Value**  
Vector with the two words capitalized.

**Author(s)**  
Guillermo Vinue

**Examples**  
capit_two_words("valencia basket")
do_add_adv_stats

---

**do_add_adv_stats**  
*Advanced statistics*

---

**Description**

This function adds to the whole data frame the advanced statistics for every player in every game.

**Usage**

```r
do_add_adv_stats(df)
```

**Arguments**

- `df`  
  Data frame with the games and the players info.

**Details**

The advanced statistics computed are as follows:

- `GameSc`: Game Score.
- `PIE`: Player Impact Estimate.
- `EFGPerc`: Effective Field Goal Percentage.
- `ThreeRate`: Three points attempted regarding the total field goals attempted.
- `FRate`: Free Throws made regarding the total field goals attempted.
- `STL_TOV`: Steal to Turnover Ratio.
- `AST_TOV`: Assist to Turnover Ratio.
- `PPS`: Points Per Shot.
- `OE`: Offensive Efficiency.
- `EPS`: Efficient Points Scored.

The detailed definition of some of these stats can be found at [https://www.basketball-reference.com/about/glossary.html](https://www.basketball-reference.com/about/glossary.html) and [https://stats.nba.com/help/glossary/](https://stats.nba.com/help/glossary/).

**Value**

Data frame.

**Author(s)**

Guillermo Vinue

**See Also**

`do_OE`, `do_EPS`
do_EPS

Examples

df <- do_join_games_bio("ACB", acb_games_1718, acb_players_1718)
df1 <- do_add_adv_stats(df)

do_EPS df

Efficient Points Scored (EPS)

Description

A limitation of do_OE is that it doesn’t rely on the quantity of the player’s offense production, that’s to say, whether the player provides a lot of offense or not. In addition, it does not give credit for free-throws. An extension of do_OE has been defined: the Efficient Points Scored (EPS), which is the result of the product of OE and points scored. Points scored counts free-throws, two-point and three-point field goals. A factor $F$ is also added to put the adjusted total points on a points scored scale. With the factor $F$, the sum of the EPS scores for all players in a given season is equal to the sum of the league total points scored in that season.

Usage

do_EPS(df)

Arguments

- df: Data frame with the games and the players info.

Value

EPS values.

Author(s)

Guillermo Vinue

References


See Also

do_OE, do_add_adv_stats

Examples

df <- do_join_games_bio("ACB", acb_games_1718, acb_players_1718)
df1 <- do_add_adv_stats(df)
do_EPS(df1)[1]
do_four_factors_df

Four factors data frame

Description
This function computes team’s offense and defense four factors. The four factors are Effective Field Goal Percentage (EFGP), Turnover Percentage (TOVP), Offensive Rebound Percentage (ORBP) and Free Throws Rate (FTRate). They are well defined at [http://www.rawbw.com/~deano/articles/20040601_roboscout.htm](http://www.rawbw.com/~deano/articles/20040601_roboscout.htm) and [https://www.basketball-reference.com/about/factors.html](https://www.basketball-reference.com/about/factors.html).

As a summary, EFGP is a measure of shooting efficiency; TOVP is the percentage of possessions where the team missed the ball, see [http://www.nba.com/thunder/news/stats101.html](http://www.nba.com/thunder/news/stats101.html) to read about the 0.44 coefficient; ORBP measures how many rebounds were offensive from the total of available rebounds; Finally, FTRate is a measure of both how often a team gets to the line and how often they make them.

Usage

do_four_factors_df(df_games, teams)

Arguments

df_games Data frame with the games, players info, advanced stats and eventually recoded teams names.
teams Teams names.

Details
Instead of defining the Offensive and Defensive Rebound Percentage as mentioned in the previous links, I have computed just the Offensive Rebound Percentage for the team and for its rivals. This makes easier to have four facets, one per factor, in the ggplot.

In order to establish the team rankings, we have to consider these facts: In defense (accumulated statistics of the opponent teams to the team of interest), the best team in each factor is the one that allows the smallest EFGP, the biggest TOVP, the smallest ORBP and the smallest FTRate, respectively.

In offense (accumulated statistics of the team of interest), the best team in each factor is the one that has the biggest EFGP, the smallest TOVP, the biggest ORBP and the biggest FTRate, respectively.

Value
A list with two data frames, df_rank and df_no_rank. Both have the same columns:

- Team: Team name.
- Type: Either Defense or Offense.
- EFGP, ORBP, TOVP and FTRate.

The df_rank data frame contains the team ranking label for each statistic between parentheses. Therefore, df_no_rank is used to create the ggplot with the numerical values and df_rank is used to add the ranking labels.
do_join_games_bio

Author(s)
Guillermo Vinue

See Also
get_four_factors_plot

Examples
```r
df <- do_join_games_bio("ACB", acb_games_1718, acb_players_1718)
df1 <- do_add_adv_stats(df)
df_four_factors <- do_four_factors_df(df1, "Valencia")
```

---

**do_join_games_bio**  
*Join games and players' info*

**Description**
This function calls the needed ancillary functions to join the games played by all the players in the desired competition (currently ACB, Euroleague and Eurocup) with their personal details.

**Usage**
```r
do_join_games_bio(competition, df_games, df_rosters)
```

**Arguments**
- `competition`  
  String. Options are "ACB", "Euroleague" and "Eurocup".
- `df_games`  
  Data frame with the games.
- `df_rosters`  
  Data frame with the biography of the roster players.

**Value**
Data frame.

**Author(s)**
Guillermo Vinue

**See Also**
join_players_bio_age_acb, join_players_bio_age_euro

**Examples**
```r
df <- do_join_games_bio("ACB", acb_games_1718, acb_players_1718)
```
do_map_nats  
__Data frame for the nationalities map__

**Description**

This function prepares the data frame with the nationalities to be mapped with `get_map_nats`. It is used inside it.

**Usage**

```r
do_map_nats(df_stats)
```

**Arguments**

- `df_stats`  
  Data frame with the statistics and the corrected nationalities.

**Value**

List with the following elements:

- `df_all`: Data frame with each country, its latitudes and longitudes and whether it must be coloured or not (depending on if there are players from that country).
- `countr_num`: Vector with the countries from where there are players and the number of them.
- `leng`: Number of countries in the world.

**Author(s)**

Guillermo Vinue

**See Also**

- `get_map_nats`

---

**do_OE**  
__Offensive Efficiency (OE)__

**Description**

Offensive Efficiency (OE) is a measure to evaluate the quality of offense produced. OE counts the total number of successful offensive possessions the player was involved in, regarding the player’s total number of potential ends of possession.

This measure is used in the definition of `do_EPS`.

**Usage**

```r
do_OE(df)
```
Arguments

   df    Data frame with the games and the players info.

Value

OE values.

Note

When either both the numerator and denominator of the OE expression are 0 or just the denominator is 0, the function returns a 0.

Author(s)

Guillermo Vinue

References


See Also

do_EPS, do_add_adv_stats

Examples

df <- do_join_games_bio("ACB", acb_games_1718, acb_players_1718)
df1 <- do_add_adv_stats(df)
# Players with OE = 0:
# df1[55, c("Player.x", "FG", "AST", "FGA", "ORB", "TOV")]
# Player.x FG AST FGA ORB TOV
# Triguero, J. 0 0 0 0 0 0
# OE can be greater than 1, for example:
# df1[17, c("Player.x", "FG", "AST", "FGA", "ORB", "TOV")]
# Player.x FG AST FGA ORB TOV
# Diagne, Moussa 3 0 3 1 0
# OE(df1[1,])
do_scraping_games

Usage

do_scraping_games(competition, type_league, nums, year, verbose, accents, r_user)

Arguments

  competition String. Options are "ACB", "Euroleague" and "Eurocup".
  type_league String. If competition is ACB, to scrape ACB league games ("ACB"), Copa del Rey games ("CREY") or Supercopa games ("SCOPA").
  nums Numbers corresponding to the website from which scraping.
  year If competition is either Euroleague or Eurocup, the year when the season starts is needed. 2017 refers to 2017-2018 and so on.
  verbose Should R report information on progress? Default TRUE.
  accents If competition is ACB, should we keep the Spanish accents? The recommended option is to remove them, so default FALSE.
  r_user Email to identify the user when doing web scraping. This is a polite way to do web scraping and to certify that the user is working as transparently as possible with a research purpose.

Value

A data frame with the player game finder data for the competition selected.

Author(s)

Guillermo Vinue

See Also

scraping_games_acb, scraping_games_euro

Examples

## Not run:
# Not needed to scrape every time the package is checked, built and installed.
df1 <- do_scraping_games(competition = "ACB", type_league = "ACB", nums = 62001,
                         year = "2017-2018", verbose = TRUE, accents = FALSE,
                         r_user = "guillermo.vinue@uv.es")

df1_eur <- do_scraping_games(competition = "Euroleague", nums = 1,
                           year = "2017", verbose = TRUE,
                           r_user = "guillermo.vinue@uv.es")

## End(Not run)
do_scraping_rosters

Players profile data

Description

This function calls the needed ancillary functions to scrape the players’ profile data for the desired competition (currently, ACB, Euroleague and Eurocup).

Usage

```
do_scraping_rosters(competition, pcode, verbose, accents, year, r_user)
```

Arguments

- **competition**: String. Options are "ACB", "Euroleague" and "Eurocup".
- **pcode**: Code corresponding to the player’s website to scrape.
- **verbose**: Should R report information on progress? Default TRUE.
- **accents**: If competition is ACB, should we keep the Spanish accents? The recommended option is to remove them, so default FALSE.
- **year**: If competition is either Euroleague or Eurocup, the year when the season starts is needed. 2017 refers to 2017-2018 and so on.
- **r_user**: Email to identify the user when doing web scraping. This is a polite way to do web scraping and to certify that the user is working as transparently as possible with a research purpose.

Value

A data frame with the players’ information.

Author(s)

Guillermo Vinue

See Also

- `scraping_games_acb`
- `scraping_rosters_euro`

Examples

```
## Not run:
# Not needed to scrape every time the package is checked, built and installed.
df_bio <- do_scraping_rosters(competition = "ACB", pcode = "56C",
                            verbose = TRUE, accents = FALSE,
                            r_user = "guillermo.vinue@uv.es")

df_bio_eur <- do_scraping_rosters(competition = "Euroleague", pcode = "007969",
                                year = "2017", verbose = TRUE,
                                r_user = "guillermo.vinue@uv.es")
```
do_stats

Accumulated or average statistics

Description

This function computes either the total or the average statistics.

Usage

```r
do_stats(df_games, type_stats = "Total", season, competition, type_season)
```

Arguments

- `df_games`: Data frame with the games, players info, advanced stats and eventually recoded teams names.
- `type_stats`: String. In English, the options are "Total" and "Average" and in Spanish, the options are "Totales" and "Promedio".
- `season`: String indicating the season, for example, 2017-2018.
- `competition`: String. Options are "ACB", "Euroleague" and "Eurocup".
- `type_season`: String with the round of competition, for example regular season or playoffs and so on.

Value

Data frame.

Author(s)

Guillermo Vinue

Examples

```r
compet <- "ACB"
df <- do_join_games_bio(compet, acb_games_1718, acb_players_1718)
df1 <- do_add_adv_stats(df)
df2 <- do_stats(df1, "Total", "2017-2018", compet, "Regular Season")
```
do_stats_teams

Accumulated and average statistics for teams

Description

This function computes the total and average statistics for every team.

Usage

```r
do_stats_teams(df_games, season, competition, type_season)
```

Arguments

- **df_games**: Data frame with the games, players info, advanced stats and eventually recoded teams names.
- **season**: String indicating the season, for example, 2017-2018.
- **competition**: String. Options are "ACB", "Euroleague" and "Eurocup".
- **type_season**: String with the round of competition, for example regular season or playoffs and so on.

Value

A list with two elements:

- `df_team_total`: Data frame with the total statistics for every team.
- `df_team_mean`: Data frame with the average statistics for every team.

Author(s)

Guillermo Vinue

Examples

```r
compet <- "ACB"
df <- do_join_games_bio(compet, acb_games_1718, acb_players_1718)
df$Compet <- compet
df_teams <- do_stats_teams(df, "2017-2018", "ACB", "Regular Season")
# Total statistics:
#df_teams$df_team_total
# Average statistics:
#df_teams$df_team_mean
```
# eurocup_games_1718

**Eurocup games 2017-2018**

**Description**

Games of the ten days of regular season and the first three days of top 16 of the Eurocup 2017-2018 season.

**Usage**

`eurocup_games_1718`

**Format**

Data frame with 3604 rows and 38 columns.

**Source**

http://www.eurocupbasketball.com/

---

# eurocup_players_1718

**Eurocup players 2017-2018**

**Description**

Players corresponding to the games of the ten days of regular season and the first three days of top 16 of the Eurocup 2017-2018 season.

**Usage**

`eurocup_players_1718`

**Format**

Data frame with 351 rows and 7 columns.

**Source**

http://www.eurocupbasketball.com/
euroleague_games_1718

Euroleague games 2017-2018

Description
Games of the first nineteen days of the Euroleague 2017-2018 season.

Usage
euroleague_games_1718

Format
Data frame with 3932 rows and 38 columns.

Source
http://www.euroleague.net

euroleague_players_1718

Euroleague players 2017-2018

Description
Players corresponding to the games of the first nineteen days of the Euroleague 2017-2018 season.

Usage
euroleague_players_1718

Format
Data frame with 245 rows and 7 columns.

Source
http://www.euroleague.net
get_barplot_monthly_stats

Barplots with monthly stats

Description
In all the available basketball websites, the stats are presented for the whole number of games played. This function represents a barplot with the players' stats for each month, which is very useful to analyse the players' evolution.

Usage
get_barplot_monthly_stats(df_stats, title, size_text = 2.5)

Arguments
- df_stats: Data frame with the statistics.
- title: Plot title.
- size_text: Label size for each bar. Default 2.5.

Value
Graphical device.

Author(s)
Guillermo Vinue

See Also
capit_two_words

Examples
```r
## Not run:
library(dplyr)
compet <- "ACB"
df <- do_join_games_bio(compet, acb_games_1718, acb_players_1718)
df1 <- do_add_adv_stats(df)

months <- c(df %>% distinct(Month))$Month
months_plot <- match(months_order, months)
months_plot1 <- months_plot[!is.na(months_plot)]
months_plot2 <- months[months_plot1]

df3_m <- df1 %>%
```
filter(Team == "Real_Madrid", 
    Player.x == "Doncic, Luka") %>%
group_by(Month) %>%
do(do_stats(., "Average", "2017-2018", "ACB", "Regular Season")) %>%
ungroup() %>%
mutate(Month = factor(Month, levels = months_plot2)) %>%
arrange(Month)

stats <- c("GP", "MP", "PTS", "FGA", "FGPerc", "ThreePA", 
    "ThreePerc", "FTA", "FTPerc", 
    "TRB", "ORB", "AST", "TOV", "STL")

df3_m1 <- df3_m %>%
    select(1:5, stats, 46:50)
get_barplot_monthly_stats(df3_m1, 
    paste("; ACB", "2017-2018", "Average", sep = " ", 2.5))

# For all teams and players:
teams <- as.character(sort(unique(df1$Team)))
df3_m <- df1 %>%
    filter(Team == teams[13]) %>%
group_by(Month) %>%
do(do_stats(., "Average", "2017-2018", "ACB", "Regular Season")) %>%
ungroup() %>%
mutate(Month = factor(Month, levels = months_plot2)) %>%
arrange(Month)
df3_m1 <- df3_m %>%
    select(1:5, stats, 46:50)
for (i in unique(df3_m1$Name)) {
    print(i)
    print(get_barplot_monthly_stats(df3_m1 %>% filter(Name == i), 
        paste("; ACB", "2017-2018", "Average", sep = " ", 2.5))
}

## End(Not run)

---

**Basketball bubble plot**

**Description**

This plot is a representation of the percentiles of all statistics for a particular player. The figure shows four cells. The first box contains the percentiles between 0 and 24. The second, between 25 and 49. The third, between 50 and 74 and the fourth, between 75 and 100. The percentiles are computed with the function `percentilsArchetypoid`. Boxes of the same percentile category are in the same color in the interests of easy understanding.
This type of visualization allows the user to analyze each player in a very simple way, since a general idea of those aspects of the game in which the player excels can be obtained.

Usage

```r
get_bubble_plot(df_stats, player, descr_stats, size_text, size_text_x, size_legend)
```

Arguments

- `df_stats`: Data frame with the statistics.
- `player`: Player.
- `descr_stats`: Description of the statistics for the legend.
- `size_text`: Text size inside each box.
- `size_text_x`: Stats labels size.
- `size_legend`: Legend size.

Details

In the example shown below, it can be seen that Alberto Abalde has a percentile of x in free throws percentage. This means that the x percent of league players has a fewer percentage than him, while there is a (100-x) percent who has a bigger percentage.

Value

Graphical device.

Author(s)

This function has been created using the code from this website: [https://www.r-bloggers.com/visualizing-the-best/](https://www.r-bloggers.com/visualizing-the-best/).

See Also

- `percentils`<br>- `Archetypoid`

Examples

```r
# Not run:
compet <- "ACB"

df <- do_join_games_bio(compet, acb_games_1718, acb_players_1718)
df1 <- do_add_adv_stats(df)
df2 <- do_stats(df1, "Total", "2017-2018", compet, "Regular Season")
# When choosing a subset of stats, follow the order in which they appear
# in the data frame.
"FTA", "FTPerc", "TRB", "ORB", "AST", "STL", "TOV")
df2_1 <- df2[, c(1:5, which(colnames(df2) %% stats), 46:49)]
descr_stats <- c("Games played", "Minutes played", "Points",
"Field goals attempted", "Field goals percentage",
"3-point field goals attempted", "3-point percentage",
"3-point attempts", "3-point percentage")
```
get_four_factors_plot

get_bubble_plot(df2_1, "Abalde, Alberto", descr_stats, 6, 10, 12)

## End(Not run)

get_four_factors_plot Four factors plot

Description

Once computed the team’s factors and its rankings with do_four_factors_df, this function represents them.

Usage

get_four_factors_plot(df_rank, df_no_rank, team, language)

Arguments

- df_rank: Data frame with the team’s offense and defense four factors and its ranking labels.
- df_no_rank: Data frame with the team’s offense and defense four factors.
- team: Team name. Multiple teams can be chosen.

Value

Graphical device.

Author(s)

Guillermo Vinue

See Also

do_four_factors_df
Examples

```r
## Not run:
df <- do_join_games_bio("ACB", acb_games_1718, acb_players_1718)
df1 <- do_add_adv_stats(df)
team <- "Valencia"
df_four_factors <- do_four_factors_df(df1, team)
# If only one team is represented the ranking between parentheses is just one.
get_four_factors_plot(df_four_factors$df_rank,
                      df_four_factors$df_no_rank, team, "en")
## End(Not run)
```

get_games_rosters  

*Get all games and rosters*

Description

This function is to get all the games and rosters of the competition selected.

Usage

```r
get_games_rosters(competition, type_league, nums, verbose = TRUE,
                  accents = FALSE, r_user, df0, df_bio0)
```

Arguments

- `competition`  
  String. Options are "ACB", "Euroleague" and "Eurocup".
- `type_league`  
  String. If competition is ACB, to scrape ACB league games ("ACB"), Copa del Rey games ("CREY") or Supercopa games ("SCOPA").
- `nums`  
  Numbers corresponding to the website from which scraping.
- `verbose`  
  Should R report information on progress? Default TRUE.
- `accents`  
  If competition is ACB, should we keep the Spanish accents? The recommended option is to remove them, so default FALSE.
- `r_user`  
  Email to identify the user when doing web scraping. This is a polite way to do web scraping and to certify that the user is working as transparently as possible with a research purpose.
- `df0`  
  Data frame to save the games data.
- `df_bio0`  
  Data frame to save the rosters data.

Value

- Data frame.

Author(s)

- Guillermo Vinue
Examples

```r
## Not run:
library(readr)
# 1. The first time, all the historical data until the last games played can be
# directly scraped.

# ACB seasons available and corresponding games numbers:
acb_nums <- list(30001:30257, 31001:31262, 32001:32264, 33001:33492, 34001:34487,
                 35001:35494, 36001:36498, 37001:37401, 38001:38347, 39001:39417,
                 40001:40415, 41001:41351, 42001:42350, 43001:43339, 44001:44341,
                 45001:45339, 46001:46339, 47001:47339, 48001:48341, 49001:49341,
                 50001:50339, 51001:51340, 52001:52327, 53001:53294, 54001:54331,
                 55001:55331, 56001:56333, 57001:57333, 58001:58332, 59001:59331,
                 60001:60332, 61001:61298, 62001:62135)
names(acb_nums) <- paste(as.character(1985:2017), as.character(1986:2018), sep = "-")
df0 <- data.frame()
df_bio0 <- data.frame(CombinID = NA, Player = NA, Position = NA,
                      Height = NA, Date_birth = NA,
                      Nationality = NA, Licence = NA, Website_player = NA)

# All the games and players:
get_data <- get_games_rosters(competition = "ACB", type_league = "ACB",
                               nums = acb_nums, verbose = TRUE, accents = FALSE,
                               r_user = "guillermo.vinue@uv.es",
                               df0 = df0, df_bio0 = df_bio0)
acb_games <- get_data$df0
acb_players <- get_data$df_bio0
write_csv(acb_games, path = "acb_games.csv")
write_csv(acb_players, path = "acb_players.csv")

# 2. Then, in order to scrape new games as they are played, the df0 and df_bio0 objects are
# the historical games and rosters:
acb_nums <- list(62136:62153)
names(acb_nums) <- "2017-2018"
df0 <- read_csv("acb_games.csv", guess_max = 1e5)
df_bio0 <- read_csv("acb_players.csv", guess_max = 1e3)
get_data <- get_games_rosters(competition = "ACB", type_league = "ACB",
                               nums = acb_nums, verbose = TRUE, accents = FALSE,
                               r_user = "guillermo.vinue@uv.es",
                               df0 = df0, df_bio0 = df_bio0)

# -----

# ACB Copa del Rey seasons available and corresponding games numbers (rosters were
# already downloaded with the ACB league):
acb_crey_nums <- list(50001:50004, 51001:51007, 52001:52007, 53003:53039,
                      54033:54039, 55033:55040, 56033:56040, 57029:57036,
                      58025:58032, 59038:59045, 60001:60008, 61001:61007,
                      62001:62007, 63001:63007, 64001:64007, 65001:65007,
                      66001:66007, 67001:67007, 68001:68007, 69001:69007,
```
get_games_rosters

70001:70007, 71001:71007, 72001:72007, 73001:73007,
74001:74007, 75001:75007, 76001:76007, 77001:77007,
78001:78007, 79001:79007, 80001:80007, 81001:81007)

names(acb_crey_nums) <- paste(as.character(1985:2016), as.character(1986:2017), sep = "-")

df0 <- data.frame()
get_data <- get_games_rosters(competition = "ACB", type_league = "CREY",
    nums = acb_crey_nums, verbose = TRUE, accents = FALSE,
r_user = "guillermo.vinue@uv.es",
df0 = df0, df_bio0 = NULL)

acb_crey_games <- get_data$df0
write_csv(acb_crey_games, path = "acb_crey_games.csv")

# -----

# ACB Supercopa seasons available and corresponding games numbers (rosters were already downloaded with the ACB league):
acb_scopa_nums <- list(1001, 2001, 3001, 4001, 5001:5004, 6001:6004,
    7001:7003, 9001:9003, 10001:10003, 11001:11003,
    12001:12003, 13001:13003, 14001:14003, 15001:15003,
    16001:16003, 17001:17003, 18001:18003, 19001:19003)

# I haven't found the data for the supercopa in Bilbao 2007 ; 8001:8003
# http://www.acb.com/fichas/SCOPA8001.php
names(acb_scopa_nums) <- c(paste(as.character(1984:1987), as.character(1985:1988), sep = "-"),

df0 <- data.frame()
get_data <- get_games_rosters(competition = "ACB", type_league = "SCOPA",
    nums = acb_scopa_nums, verbose = TRUE, accents = FALSE,
r_user = "guillermo.vinue@uv.es",
df0 = df0, df_bio0 = NULL)

acb_scopa_games <- get_data$df0
write_csv(acb_scopa_games, path = "acb_scopa_games.csv")

# -----

# Euroleague seasons available and corresponding games numbers:
euroleague_nums <- list(1:128,
    1:263, 1:250, 1:251, 1:253, 1:253, 1:188, 1:189,
    1:188, 1:188, 1:231, 1:231, 1:231, 1:229, 1:220,
    1:220, 1:275, 1:169)

names(euroleague_nums) <- 2017:2000

df0 <- data.frame()
df_bio0 <- data.frame(CombinID = NA, Player = NA, Position = NA,
    Height = NA, Date_birth = NA,
    Nationality = NA, Website_player = NA)
get_data <- get_games_rosters(competition = "Euroleague", nums = euroleague_nums,
    verbose = TRUE, r_user = "guillermo.vinue@uv.es",
df0 = df0, df_bio0 = df_bio0)
euroleague_games <- get_data$df0
euroleague_players <- get_data$df_bio0
write.csv(euroleague_games, path = "euroleague_games.csv")
write.csv(euroleague_players, path = "euroleague_players.csv")

# -----

# Eurocup seasons available and corresponding games numbers:
eurocup_nums <- list(1:128,
                    1:151, 1:326, 1:149, 1:149, 1:239, 1:209, 1:150)
names(eurocup_nums) <- 2017:2002
df0 <- data.frame()
df_bio0 <- data.frame(CombinID = NA, Player = NA, Position = NA,
                      Height = NA, Date_birth = NA,
                      Nationality = NA, Website_player = NA)
get_data <- get_games_rosters(competition = "Eurocup", nums = eurocup_nums,
                              verbose = TRUE, r_user = "guillermo.vinue@uv.es",
                              df0 = df0, df_bio0 = df_bio0)
eurocup_games <- get_data$df0
eurocup_players <- get_data$df_bio0
write.csv(eurocup_games, path = "eurocup_games.csv")
write.csv(eurocup_players, path = "eurocup_players.csv")

## End(Not run)
stat_ord To sort the heatmap on one particular statistic.
base_size Sets the font size in the theme used. Default 9.
title Plot title.

Value
Graphical device.

Author(s)
This function has been created using the code from these websites: https://learnr.wordpress.com/2010/01/26/ggplot2-quick-heatmap-plotting/ and http://stackoverflow.com/questions/13016022/ggplot2-heatmaps-using-different-gradients-for-categories/13016912

Examples
## Not run:
compet <- "ACB"
comp <- do_join_games_bio(compet, acb_games_1718, acb_players_1718)
comp <- do_add_adv_stats(comp)
comp <- do_stats(comp, "Total", "2017-2018", compet, "Regular Season")
teams <- as.character(rev(sort(unique(comp$Team))))
get_heatmap_bb(comp, teams[6], NULL, "MP", 9, paste(compet, "2017-2018", "Total", sep = " "))

## End(Not run)

get_map_nats Nationalities map

Description
A world map is represented. The countries from where there are players in the competition selected are in green color.

Usage
get_map_nats(df_stats)

Arguments
df_stats Data frame with the statistics and the corrected nationalities.

Value
Graphical device.
get_pop_pyramid

Author(s)
Guillermo Vinue

See Also
do_map_nats

Examples

```r
## Not run:
compet <- "ACB"
df <- do_join_games_bio(compet, acb_games_1718, acb_players_1718)
df1 <- do_add_adv_stats(df)
df2 <- do_stats(df1, "Total", "2017-2018", compet, "Regular Season")
get_map_nats(df2)

## End(Not run)
```

---

get_pop_pyramid | Population pyramid

**Description**

This is the code to get a population pyramid with the number of both Spanish and foreigner players along the seasons for the ACB league. This aids in discussion of nationality imbalance.

**Usage**

`get_pop_pyramid(df, title, language)`

**Arguments**

- `df` | Data frame that contains the ACB players’ nationality.
- `title` | Title of the plot
- `language` | String, "eng" for English labels; "esp" for Spanish labels.

**Value**

Graphical device.

**Author(s)**
Guillermo Vinue
get_shooting_plot  

Shooting plot

Description

This plot represents the number of shots attempted and scored by every player of the same team, together with the scoring percentage. The players are sorted by percentage.

Usage

get_shooting_plot(df_stats, team, type_shot, min_att, title, language)

Arguments

df_stats  Data frame with the statistics.
team  Team.
type_shot  Numeric with values 1-2-3: 1 refers to free throws, 2 refers to two point shots and 3 refers to three points shots.
min_att  Minimum number of attempts by the player to be represented in the plot.
title  Plot title.
language  Language labels. Current options are 'en' for English and 'es' for Spanish.

Value

Graphical device.

Author(s)

Guillermo Vinue
get_similar_players

Examples

```r
## Not run:
compet <- "ACB"
df <- do_join_games_bio(compet, acb_games_1718, acb_players_1718)
df1 <- do_add_adv_stats(df)
df2 <- do_stats(df1, "Total", "2017-2018", compet, "Regular Season")
get_shooting_plot(df2, "Valencia", 3, 1,
paste("Valencia", compet, "2017-2018", sep = " "), "en")

## End(Not run)
```

get_similar_players Similar players to archetypoids

Description

Similar players to the archetypoids computed with archetypoids according to a similarity threshold.

Usage

get_similar_players(atype, threshold, alphas, cases, data, variables, compet, season)

Arguments

- `atype` Number assigned to the archetypoid (1:length(cases)) from which searching the players who most resemble to it.
- `threshold` Similarity threshold.
- `alphas` Alpha values of all the players.
- `cases` Archetypoids.
- `data` Data frame with the statistics.
- `variables` Statistics used to compute the archetypoids.
- `compet` Competition.
- `season` Season.

Value

Data frame with the features of the similar players.

Author(s)

Guillermo Vinue

See Also

archetypoids
get_similar_teams

Examples

```r
(s0 <- Sys.time())
# Turn off temporarily some negligible warnings from the
# archetypes package to avoid misunderstandings. The code works well.
library(Anthropometry)
df <- do_join_games_bio("ACB", acb_games_1718, acb_players_1718)
df1 <- do_add_adv_stats(df)
df2 <- do_stats(df1, "Total", "2017-2018", "ACB", "Regular Season")
df3 <- df2[which(df2$Position == "Guard")[1:31], c("MP", "PTS", "Name")]
preproc <- preprocessing(df3[,1:2], stand = TRUE, percAccomm = 1)
set.seed(4321)
suppressWarnings(lass <- stepArchetypesRawData(preproc$data, 1:2,
   numRep = 20, verbose = FALSE))
res <- archetypoids(2, preproc$data, huge = 200, step = FALSE, ArchObj = lass,
   nearest = "cand_ns", sequ = TRUE)
# The S3 class of anthrCases from Anthropometry has been updated.
cases <- anthrCases(res)
df3[cases,] # https://github.com/r-quantities/units/issues/225
alphas <- round(res$alphas, 4)
df3_aux <- df2[which(df2$Position == "Guard")[1:31],]
get_similar_players(1, 0.99, alphas, cases, df3_aux, c("MP", "PTS"),
   unique(df3_aux$Compet), unique(df3_aux$Season))
s1 <- Sys.time() - s0
ts1
```

---

get_similar_teams

Similar teams to archetypoids

Description

Similar teams to the archetypoids computed with archetypoids according to a similarity threshold.

Usage

get_similar_teams(etype, threshold, alphas, cases, data, variables)

Arguments

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>atype</td>
<td>Number assigned to the archetypoid (1:length(cases)) from which searching the players who most resemble to it.</td>
</tr>
<tr>
<td>threshold</td>
<td>Similarity threshold.</td>
</tr>
<tr>
<td>alphas</td>
<td>Alpha values of all the players.</td>
</tr>
<tr>
<td>cases</td>
<td>Archetypoids.</td>
</tr>
<tr>
<td>data</td>
<td>Data frame with the statistics.</td>
</tr>
<tr>
<td>variables</td>
<td>Statistics used to compute the archetypoids.</td>
</tr>
</tbody>
</table>
get_stats_seasons  

Season-by_season stats  

Description  
This function represents the average values of a set of statistics for certain players in every season where the players played. It gives an idea of the season-by-season performance.

Usage  
get_stats_seasons(df, competition, player, variabs, type_season, add_text, show_x_axis)
get_table_results

League cross table

Description

The league results are represented with a cross table.

Arguments

- **df**: Data frame with the games and the players info.
- **competition**: Competition.
- **player**: Players' names.
- **variabs**: Vector with the statistics to plot.
- **type_season**: String with the round of competition, for example regular season or playoffs and so on.
- **add_text**: Boolean. Should text be added to the plot points?
- **show_x_axis**: Boolean. Should x-axis labels be shown in the plot?

Value

List with two elements:

- `gg`: Graphical device.
- `df_gg`: Data frame associated with the plot.

Author(s)

Guillermo Vinue

Examples

```r
# Not run:
competition <- "ACB"
df <- do_join_games_bio("ACB", acb_games_1718, acb_players_1718)
df$Compet <- competition
player <- "Carroll, Jaycee"
variabs <- c("GP", "MP", "PTS", "EFGPerc", "TRB", "AST", "TOV", "PIR")
plot_yearly <- get_stats_seasons(df, competition, player, variabs, "All", TRUE, TRUE)
plot_yearly$gg
# There are only games from the regular season in this demo data frame.
plot_yearly1 <- get_stats_seasons(df, competition, player, variabs, "Regular Season", TRUE, TRUE)
plot_yearly1$gg
```

```r
## End(Not run)
```
join_players_bio_age_acb

Usage

get_table_results(df, competition, season)

Arguments

df Data frame with the games and the players info.
competition Competition.
season Season.

Value

List with these two elements:

- plot_teams Graphical device with the cross table.
- wins_teams Vector with the team wins.

Author(s)

Guillermo Vinue

Examples

## Not run:
df <- do_join_games_bio("ACB", acb_games_1718, acb_players_1718)
df$Compet <- "ACB"

gg <- get_table_results(df, "ACB", "2017-2018")

gg$wins_teams
gg$plot_teams

## End(Not run)

join_players_bio_age_acb

Join ACB games and players' info

Description

This function joins the ACB games with the players' bio and computes the players' age at each game.

Usage

join_players_bio_age_acb(df_games, df_rosters)
Arguments

  df_games    Data frame with the games.
  df_rosters Data frame with the biography of the roster players.

Value

  Data frame.

Author(s)

  Guillermo Vinue

See Also

  do_join_games_bio

Examples

  df <- join_players_bio_age_acb(acb_games_1718, acb_players_1718)

join_players_bio_age_euro

  Join Euroleague and Eurocup games and players’ info

Description

  This function joins the Euroleague/Eurocup games with the players’ bio and computes the players’ age at each game.

Usage

  join_players_bio_age_euro(df_games, df_rosters)

Arguments

  df_games    Data frame with the games.
  df_rosters Data frame with the biography of the roster players.

Value

  Data frame.

Author(s)

  Guillermo Vinue
scraping_games_acb

See Also
do_join_games_bio

Examples
df <- join_players_bio_age_euro(euroleague_games_1718, euroleague_players_1718)

scraping_games_acb  ACB player game finder data

Description
This function allows us to get all the player game finder data for all the desired ACB seasons available from: http://www.acb.com.

Usage
scraping_games_acb(type_league, nums, year, verbose = TRUE, accents = FALSE, r_user = "guillermo.vinue@uv.es")

Arguments
  type_league String. If competition is ACB, to scrape ACB league games ("ACB"), Copa del Rey games ("CREY") or Supercopa games ("SCOPA").
  nums Numbers corresponding to the website to scrape.
  year Season, e.g. 2017-2018.
  verbose Should R report information on progress? Default TRUE.
  accents Should we keep the Spanish accents? The recommended option is to remove them, so default FALSE.
  r_user Email to identify the user when doing web scraping. This is a polite way to do web scraping and to certify that the user is working as transparently as possible with a research purpose.

Details
The official website of the Spanish basketball league ACB presents the statistics of each game in a php website, such as: http://www.acb.com/fichas/LACB62090.php.
Note that for example http://www.acb.com/fichas/LACB60315.php doesn’t exist, so for these cases is where we can use the httr package.
In https://www.uv.es/vivigui/docs/acb_scraping.pdf a document is available with the exact numbers xxxxx related to http://www.acb.com/fichas/LACBxxxxx.php for some seasons.

Value
A data frame with the player game finder data.
scraping_games_euro

Note

In addition to use the email address to stay identifiable, the function also contains two headers regarding the R platform and version used.

Furthermore, even though in the robots.txt file at http://www.acb.com/robots.txt, there is no information about scraping limitations and all robots are allowed to have complete access, the function also includes the command `Sys.sleep(2)` to pause between requests for 2 seconds. In this way, we don’t bother the server with multiple requests and we do carry out a friendly scraping.

Author(s)

Guillermo Vinue

See Also

do_scraping_games

Examples

```r
## Not run:
# Not needed to scrape every time the package is checked, built and installed.
# Not needed to scrape every time the package is checked, built and installed.
df1 <- scraping_games_acb(type_league = "ACB", nums = 62001:62002, year = "2017-2018",
                           verbose = TRUE, accents = FALSE,
                           r_user = "guillermo.vinue@uv.es")
## End(Not run)
```

scraping_games_euro  Euroleague and Eurocup player game finder data

Description

This function allows us to get all the player game finder data for all the desired Euroleague and Eurocup seasons available from http://www.euroleague.net/main/results/ and http://www.eurocupbasketball.com/eurocup/games/results, respectively.

Usage

```r
scraping_games_euro(competition, nums, year, verbose = TRUE,
                    r_user = "guillermo.vinue@uv.es")
```

Arguments

- **competition**: String. Options are "Euroleague" and "Eurocup".
- **nums**: Numbers corresponding to the website from which scraping.
- **year**: Year when the season starts. 2017 refers to 2017-2018 and so on.
- **verbose**: Should R report information on progress? Default TRUE.
r_user  
Email to identify the user when doing web scraping. This is a polite way to do web scraping and to certify that the user is working as transparently as possible with a research purpose.

Details

See the examples in get_games_rosters to see the game numbers to scrape in each season.

Value

A data frame with the player game finder data.

Note

In addition to use the email address to stay identifiable, the function also contains two headers regarding the R platform and version used.

Furthermore, in the robots.txt file located at http://www.euroleague.net/robots.txt and https://www.eurocupbasketball.com/robots.txt there is the Crawl-delay field which asks crawlers to pause between requests for 15 seconds. This is done by adding to the function the command Sys.sleep(15).

Author(s)

Guillermo Vinue

See Also

do_scraping_games

Examples

```r
## Not run:
# Not needed to scrape every time the package is checked, built and installed.
# It takes 15 seconds as it is required in http://www.euroleague.net/robots.txt
df1 <- do_scraping_games(competition = "Euroleague", nums = 1:2,
year = "2017", verbose = TRUE, r_user =
"guillermo.vinue@uv.es")

## End(Not run)
```
scraping_rosters_acb  ACB players’ profile

Description

This function allows us to obtain the basic information of each player, including his birth date. Then, we will be able to compute the age that each player had in the date that he played each game. The website used to collect information is https://www.acb.com.

Usage

scraping_rosters_acb(pcode, verbose = TRUE, accents = FALSE, 
r_user = "guillermo.vinue@uv.es")

Arguments

pcode  Code corresponding to the player’s website to scrape.
verbose  Should R report information on progress? Default TRUE.
accents  Should we keep the Spanish accents? The recommended option is to remove them, so default FALSE.
r_user  Email user to identify the user when doing web scraping. This is a polite way to do web scraping and to certify that the user is working as transparently as possible with a research purpose.

Details

Some players have a particular licence, which does not necessarily match with their nationality, in order not to be considered as a foreign player, according to the current ACB rules.

Value

Data frame with eight columns:

• CombinID: Unique ID to identify the players.
• Player: Player’s name.
• Position: Player’s position on the court.
• Height: Player’s height.
• Date_birth: Player’s birth date.
• Nationality: Player’s nationality.
• Licence: Player’s licence.
• Website_player: Website.
Note

In addition to use the email address to stay identifiable, the function also contains two headers regarding the R platform and version used.

Furthermore, even though in the robots.txt file at http://www.acb.com/robots.txt, there is no information about scraping limitations and all robots are allowed to have complete access, the function also includes the command Sys.sleep(2) to pause between requests for 2 seconds. In this way, we don’t bother the server with multiple requests and we do carry out a friendly scraping.

Author(s)

Guillermo Vinue

See Also

do_scraping_rosters

Examples

## Not run:
# Not needed to scrape every time the package is checked, built and installed.
df_bio <- scraping_rosters_acb("56C", verbose = TRUE, accents = FALSE,
r_user = "guillermo.vinue@uv.es")

## End(Not run)

scraping_rosters_euro  Euroleague and Eurocup players' profile

Description

This function allows us to obtain the basic information of each Euroleague/Eurocup player, including his birth date. Then, we will be able to compute the age that each player had in the date that he played each game. The websites used to collect information are https://www.euroleague.net and https://www.eurocupbasketball.com.

Usage

scraping_rosters_euro(competition, pcode, year, verbose = TRUE,
r_user = "guillermo.vinue@uv.es")

Arguments

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>competition</td>
<td>String. Options are &quot;Euroleague&quot; and &quot;Eurocup&quot;.</td>
</tr>
<tr>
<td>pcode</td>
<td>Code corresponding to the player’s website to scrape.</td>
</tr>
<tr>
<td>year</td>
<td>Year when the season starts. 2017 refers to 2017-2018 and so on.</td>
</tr>
<tr>
<td>verbose</td>
<td>Should R report information on progress? Default TRUE.</td>
</tr>
</tbody>
</table>
Email user to identify the user when doing web scraping. This is a polite way to do web scraping and to certify that the user is working as transparently as possible with a research purpose.

**Value**

Data frame with seven columns:

- **CombinID**: Unique ID to identify the players.
- **Player**: Player’s name.
- **Position**: Player’s position on the court.
- **Height**: Player’s height.
- **Date_birth**: Player’s birth date.
- **Nationality**: Player’s nationality.
- **Website_player**: Website.

**Note**

In addition to use the email address to stay identifiable, the function also contains two headers regarding the R platform and version used.

Furthermore, in the robots.txt file located at [http://www.euroleague.net/robots.txt](http://www.euroleague.net/robots.txt) and [https://www.eurocupbasketball.com/robots.txt](https://www.eurocupbasketball.com/robots.txt) there is the Crawl-delay field which asks crawlers to pause between requests for 15 seconds. This is done by adding to the function the command `Sys.sleep(15)`.

**Author(s)**

Guillermo Vinue

**See Also**

do_scraping_rosters

**Examples**

```r
## Not run:
# Not needed to scrape every time the package is checked, built and installed.
# It takes 15 seconds as it is required in http://www.euroleague.net/robots.txt
df_bio <- scraping_rosters_euro("Euroleague", "005791", "2017", verbose = TRUE,
   r_user = "guillermo.vinue@uv.es")

## End(Not run)
```
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