Get started with `unitedR`

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1 Introduction

This package provides functionality for simulation lineups and formations in United. It contains functions for finding the optimal formation to beat all expected lineups of opponents in the game. To install `unitedR` from CRAN, run

```
install.packages("unitedR")
```

in your `R` command line. Afterwards the package can be installed as follows:

```
library(unitedR)
```

2 Working examples

There are two main functions in the `unitedR` package:

- `formation`: define a valid lineup
- `unitedSim`, `unitedSimOne`: compare a lineup to one or several other lineups.

In the following we define a `Home` lineup and two `Away` lineups. An unused sweeper has to be termed as `NA`.

```
(home <- formation(10, NA, c(7,5,3), c(8,8), c(10,10,8,5,0)))
```

```
##
## Object of class "formation"
##
## Your selected lineup is:
##   10-0-15-16-33

(away1 <- formation(5, 8, c(8,8,0,0), c(10,10), c(10,10,10),
 hardness = c(0,0,0,0,1)))

##
## Object of class "formation"
##
## Your selected lineup is:
##   5-8-16-20-31

(away2 <- formation(10, 8, c(8,10), c(10,10), c(10,10,10,5,0),
 hardness = c(0,0,0,0,1), homeAdv = c(0,0,2,0,0)))

##
## Object of class "formation"
##
## Your selected lineup is:
##   10-8-20-20-36

# unitedSim and unitedSimOne are similar in this particular case
unitedSim(home, away1)

##
## Used lineup home was:
##   10-0-15-16-33
## Used lineup away was:
##   5-8-16-20-31
##
## The key statistcs are:
##   averageTrainingPointsHome = 0.1637
##   averageTrainingPointsAway = 0.8363
##   averagePointsHome = 0.4389
##   averagePointsAway = 2.4565
##   winProbabilityHome = 0.1114
##   winProbabilityAway = 0.784
```

```
##   tiedProbability = 0.1046
##
## The most probable results are:
##  goalsHome goalsAway probability cumsumProb
##          3         5       0.055      0.055
##          2         5       0.053      0.108
##          3         4       0.049      0.157
##          3         6       0.048      0.204
##          2         4       0.047      0.252
##          2         6       0.046      0.298
```

```
unitedSim(home, away1, away2)
```

```
##
## The used lineup home
##   10-0-15-16-33
## was compared to the following away lineups
##           away averageTrainingPointsHome averagePointsHome
##   5-8-16-20-31                    0.1637            0.4389
##  10-8-20-20-36                    0.0041            0.0096
##  winProbabilityHome tiedProbability
##              0.1114          0.1046
##              0.0014          0.0054
```

If you are using hardness it is recommended to simulate the red cards. An example is given in the following.

```
set.seed(123)
(home <- formation(10, NA, c(7,5,3), c(8,8), c(10,10,8,5,0),
                   hardness = c(0,0,4,2,1)))
```

```
##
## Object of class "formation"
##
## Your selected lineup is:
##   10-0-19-18-34
```

```
(away1 <- formation(5, 8, c(8,8,0,0), c(10,10), c(10,10,10),
 hardness = c(0,0,0,0,1)))
```

```
##
## Object of class "formation"
##
## Your selected lineup is:
##   5-8-16-20-31
```

```
(away2 <- formation(10, 8, c(8,10), c(10,10), c(10,10,10,5,0),
 hardness = c(0,0,0,0,8), homeAdv = c(0,0,2,0,0)))
```

```
##
## Object of class "formation"
##
## Your selected lineup is:
##   10-8-20-20-43
```

```
# unitedSim and unitedSimOne are similar in this particular case
unitedSim(home, away1, r = 100)
```

```
##
## Used lineup home was:
##   10-0-19-18-34
## Used lineup away was:
##   5-8-16-20-31
##
## The key statistcs based on 100 simulations are:
##   averageTrainingPointsHome = 0.39
##   averageTrainingPointsAway = 0.61
##   averagePointsHome = 1.07
##   averagePointsAway = 1.73
##   winProbabilityHome = 0.29
##   winProbabilityAway = 0.51
##   tiedProbability = 0.2
##
## The most probable results are:
##  goalsHome goalsAway probability cumsumProb
##          3         3        0.07       0.07
##          4         3        0.07       0.14
##          4         4        0.06       0.20
##          2         3        0.05       0.25
##          3         4        0.05       0.30
##          3         5        0.05       0.35
```

```
unitedSim(home, away1, away2, r = 100)

##
## The used lineup home
##   10-0-19-18-34
## was compared to the following away lineups
##           away   r averageTrainingPointsHome averagePointsHome
##   5-8-16-20-31 100                    0.265              0.74
##  10-8-20-20-43 100                    0.005              0.01
##  winProbabilityHome tiedProbability
##                0.21            0.11
##                0.00            0.01
```

Finally, if you are playing in total only with one or less points of hardness you can define formations directly. You don‘t have to define the strength of the individual players like in the working examples above.

```
(home <- formation(10, NA, 14, 14, 42))

##
## Object of class "formation"
##
## Your selected lineup is:
##   10-0-14-14-42

(away1 <- formation(5, 8, 10, 10, 30))

##
## Object of class "formation"
##
## Your selected lineup is:
##   5-8-10-10-30

(away2 <- formation(10, 8, 16, 16, 30, homeAdv = c(0,0,2,0,0)))

##
## Object of class "formation"
##
## Your selected lineup is:
##   10-8-18-16-30
```

```r
# unitedSim and unitedSimOne are similar in this particular case
unitedSim(home, away1)
```

```
##
## Used lineup home was:
##   10-0-14-14-42
## Used lineup away was:
##   5-8-10-10-30
##
## The key statistcs are:
##   averageTrainingPointsHome = 0.8602
##   averageTrainingPointsAway = 0.1398
##   averagePointsHome = 2.5429
##   averagePointsAway = 0.3818
##   winProbabilityHome = 0.8225
##   winProbabilityAway = 0.1022
##   tiedProbability = 0.0753
##
## The most probable results are:
##  goalsHome goalsAway probability cumsumProb
##          8         4       0.036      0.036
##          7         4       0.035      0.071
##          8         5       0.034      0.105
##          7         5       0.034      0.139
##          9         4       0.031      0.169
##          9         5       0.029      0.199
```

```r
unitedSim(home, away1, away2)
```

```
##
## The used lineup home
##   10-0-14-14-42
## was compared to the following away lineups
##           away averageTrainingPointsHome averagePointsHome
##   5-8-10-10-30                    0.8602            2.5429
##  10-8-18-16-30                    0.1223            0.3237
##  winProbabilityHome tiedProbability
##              0.8225          0.0753
##              0.0790          0.0865
```