Package ‘nfl4th’

October 16, 2021

Title Functions to Calculate Optimal Fourth Down Decisions in the National Football League

Version 1.0.1

Description A set of functions to estimate outcomes of fourth down plays in the National Football League and obtain fourth down plays from <https://www.nfl.com/> and <https://www.espn.com/>.

License MIT + file LICENSE


BugReports https://github.com/nflverse/nfl4th/issues

Depends R (>= 2.10)

Imports dplyr, glue, httr, janitor, magrittr, mtcv, nflfastR

Imports dplyr, glue, httr, janitor, jsonlite, magrittr, mtcv, nflfastR

Imports dplyr, glue, httr, janitor, jsonlite, magrittr, mtcv, nflfastR

Imports dplyr, glue, httr, janitor, jsonlite, magrittr, mtcv, nflfastR

Imports dplyr, glue, httr, janitor, jsonlite, magrittr, mtcv, nflfastR

Suggests future, gt, rmarkdown, tictoc, tidyverse, testthat (>= 2.0.0)

Encoding UTF-8

RoxygenNote 7.1.1

Config/testthat/edition 2

NeedsCompilation no

Author Ben Baldwin [aut, cre, cph],
    Sebastian Carl [ctb]

Maintainer Ben Baldwin <bbaldwin206@gmail.com>

Repository CRAN

Date/Publication 2021-10-16 13:50:02 UTC

R topics documented:

add_2pt_probs .................................................. 2
add_4th_probs .................................................. 3
get_4th_plays .................................................. 4
load_4th_pbp .................................................. 5
make_2pt_table_data .......................................... 6
make_table_data .............................................. 7
add_2pt_probs

Get 2pt decision probabilities

Description
Get various probabilities associated with each option on PATs (go for it, kick PAT).

Usage
add_2pt_probs(df)

Arguments
df       A data frame of decisions to be computed for.

Value
Original data frame Data frame plus the following columns added:
  first_down_prob, wp_fail, wp_succeed, go_wp, fg_make_prob, miss_fg_wp, make_fg_wp,
  fg_wp, punt_wp
  wp_0  Win probability when scoring 0 points on PAT.
  wp_1  Win probability when scoring 1 point on PAT.
  wp_2  Win probability when scoring 2 points on PAT.
  conv_1pt Probability of making PAT kick.
  conv_2pt Probability of converting 2-pt attempt.
  wp_go1 Win probability associated with going for 1.
  wp_go2 Win probability associated with going for 2.

Examples
play <-
tibble::tibble(
  # things to help find the right game (use "reg" or "post")
  home_team = "GB",
  away_team = "TB",
  posteam = "GB",
  type = "post",
  season = 2020,

  # information about the situation
  qtr = 4,
  quarter_seconds_remaining = 123,
  score_differential = -2,
  home_opening_kickoff = 0,
add_4th_probs

posteam_timeouts_remaining = 3,
defteam_timeouts_remaining = 3
)

probs <- nfl4th::add_2pt_probs(play)
dplyr::glimpse(probs)

---

add_4th_probs  Get 4th down decision probabilities

Description

Get various probabilities associated with each option on 4th downs (go for it, kick field goal, punt).

Usage

add_4th_probs(df)

Arguments

df A data frame of decisions to be computed for.

Value

Original data frame Data frame plus the following columns added:

- **go_boost** Gain (or loss) in win prob associated with choosing to go for it (percentage points).
- **first_down_prob** Probability of earning a first down if going for it on 4th down.
- **wp_fail** Win probability in the event of a failed 4th down attempt.
- **wp_succeed** Win probability in the event of a successful 4th down attempt.
- **go_wp** Average win probability when going for it on 4th down.
- **fg_make_prob** Probability of making field goal.
- **miss_fg_wp** Win probability in the event of a missed field goal.
- **make_fg_wp** Win probability in the event of a made field goal.
- **fg_wp** Average win probability when attempting field goal.
- **punt_wp** Average win probability when punting.
Examples

```r
play <-
tibble::tibble(
  # things to help find the right game (use "reg" or "post")
  home_team = "GB",
  away_team = "TB",
  posteam = "GB",
  type = "post",
  season = 2020,

  # information about the situation
  qtr = 4,
  quarter_seconds_remaining = 129,
  ydstogo = 8,
  yardline_100 = 8,
  score_difference = -8,

  home_opening_kickoff = 0,
  posteam_timeouts_remaining = 3,
  defteam_timeouts_remaining = 3
)

probs <- nfl4th::add_4th_probs(play)
dplyr::glimpse(probs)
```

---

**get_4th_plays**

Get 4th down plays from a game

**Description**

Get 4th down plays from a game.

**Usage**

```r
get_4th_plays(gid)
```

**Arguments**

- **gid** A game to get 4th down decisions of.

**Details**

Obtains a data frame that can be used with `add_4th_probs()`. The following columns must be present:

- `game_id`: game ID in nflfastR format (e.g., '2020_20_TB_GB')
Value

Original data frame Data frame plus the following columns added:

desc  Play description from ESPN.
type_text  Play type text from ESPN.
index  Index number of play from a given game. Useful for tracking plays (e.g. for 4th down bot).
The rest  All the columns needed for add_4th_probs().

Examples

```r
plays <- nfl4th::get_4th_plays('2020_20_TB_GB')
dplyr::glimpse(plays)
```

load_4th_pbp  Load calculated 4th down probabilities from nflfastR data

Description

Load calculated 4th down probabilities from nflfastR data.

Usage

```r
load_4th_pbp(seasons, fast = FALSE)
```

Arguments

seasons  Seasons to load. Must be 2014 and later.
fast  Defaults to FALSE. If TRUE, loads pre-computed decisions from repository

Value

nflfastR data on 4th downs with the add_4th_probs() columns added and also the following:

go  100 if a team went for it on 4th down, 0 otherwise. It’s 100 and 0 as a convenience for obtaining percent of times going for it.

Examples

```r
probs <- load_4th_pbp(2019:2020)
dplyr::glimpse(probs)
```
Description

Get a table with the probabilities associated with a 2-pt decision.

Usage

make_2pt_table_data(probs)

Arguments

probs  A data frame consisting of one play that has had add_2pt_probs() already run on it.

Value

A table showing the probabilities associated with each possible choice.

Examples

```r
play <- tibble::tibble(
  # things to help find the right game (use "reg" or "post")
  home_team = "GB",
  away_team = "TB",
  posteam = "GB",
  type = "post",
  season = 2020,

  # information about the situation
  qtr = 4,
  quarter_seconds_remaining = 123,
  score_difference = -2,

  home_opening_kickoff = 0,
  posteam_timeouts_remaining = 3,
  defteam_timeouts_remaining = 3
)

probs <- nfl4th::add_2pt_probs(play)
nfl4th::make_2pt_table_data(probs)
```
make_table_data

Get 4th down decision probabilities

Description

Get a table with the probabilities on 4th down.

Usage

make_table_data(probs)

Arguments

probs

A data frame consisting of one play that has had add_4th_probs() already run on it.

Value

A table showing the probabilities associated with each possible choice.

Examples

```r
play <-
tibble::tibble(
    # things to help find the right game (use "reg" or "post")
    home_team = "GB",
    away_team = "TB",
    posteam = "GB",
    type = "post",
    season = 2020,

    # information about the situation
    qtr = 4,
    quarter_seconds_remaining = 129,
    ydstogo = 8,
    yardline_100 = 8,
    score_differential = -8,

    home_opening_kickoff = 0,
    posteam_timeouts_remaining = 3,
    defteam_timeouts_remaining = 3
)

probs <- nfl4th::add_4th_probs(play)
nfl4th::make_table_data(probs)
```
Index

add_2pt_probs, 2
add_4th_probs, 3
get_4th_plays, 4
load_4th_pbp, 5
make_2pt_table_data, 6
make_table_data, 7