

Package ‘nfl4th’

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

Version 1.0.0

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/>.

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URL <https://www.nfl4th.com/>, <https://github.com/guga31bb/nfl4th/>

BugReports <https://github.com/guga31bb/nfl4th/issues>

Depends R (>= 2.10)

Imports dplyr, glue, httr, janitor, jsonlite, magrittr, mgcv, nflfastR, purrr, stringr, tibble, tidyr, tidyselect, xgboost

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R topics documented:

<code>add_2pt_probs</code>	2
<code>add_4th_probs</code>	3
<code>get_4th_plays</code>	4

load_4th_pbp	5
make_2pt_table_data	6
make_table_data	7

Index	8
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add_2pt_probs	<i>Get 2pt decision probabilities</i>
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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,
      posteam_timeouts_remaining = 3,
      defteam_timeouts_remaining = 3
    )

probs <- nfl14th::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

```
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)

dplyr::glimpse(probs)
```

get_4th_plays

Get 4th down plays from a game

Description

Get 4th down plays from a game.

Usage

```
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 (eg '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

```
plays <- nfl14th::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

```
load_4th_pbp(seasons)
```

Arguments

seasons Seasons to load. Must be 2014 and later.

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

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

make_2pt_table_data *Get 2pt decision probabilities*

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

```
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,  
    posteam_timeouts_remaining = 3,  
    defteam_timeouts_remaining = 3  
  )  
  
probs <- nfl14th::add_2pt_probs(play)  
nfl14th::make_2pt_table_data(probs)
```

make_table_data	<i>Get 4th down decision probabilities</i>
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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

```
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](#)