Package ‘nfl4th’

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

Version 1.0.2

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

Depends R (>= 2.10)

Imports dplyr, glue, httr, janitor, magrittr, mgcv, nflfastR
   (>= 4.0.0), nflreadr, purrr, stringr, tibble, tidyr,
   tidyselect, xgboost

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

Encoding UTF-8

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NeedsCompilation no

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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(
  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_kick = 0,
```r
posteam_timeouts_remaining = 3,
defteam_timeouts_remaining = 3

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

### Description

Get 4th down decision probabilities

### Usage

```r
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_differential = -8,

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

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

---

### 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 (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

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

---

**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)
```
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

```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_differential = -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)
```
**Description**

Get a table with the probabilities on 4th down.

**Usage**

```r
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)
```
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