Package 'nfl4th'

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

Version 1.0.4

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/nflverse/nfl4th/, https://github.com/nflverse/nfl4th

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

Depends R (>= 3.6)

Imports backports (>= 1.1.6), curl, dplyr, glue, httr, janitor, jsonlite, magrittr, mgcv, nflfastR (>= 4.0.0), nflreadr, purrr, rlang, stringr, tibble, tidyr, tidyselect, xgboost

Suggests data.table, future, gt, nflplotR, rmarkdown, tictoc, testthat (>= 2.0.0), withr

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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(
    # 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)

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 <- 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

```
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

```
try({# Wrap in try to avoid CRAN test problems
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 <- 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

```
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)
```

`nfl4th_clear_cache` *Reset nfl4th Package Cache*

Description

Reset nfl4th Package Cache

Usage

```
nfl4th_clear_cache(type = c("games", "fd_model", "wp_model", "all"))
```

Arguments

`type`	One of `"games"` (the default), `"fd_model"`, or `"all"`. `"games"` will remove an internally used games file. `"fd_model"` will remove the nfl4th 4th down model (only necessary in the unlikely case of a model update). `"wp_model"` will remove the nfl4th win probability model (only necessary in the unlikely case of a model update). `"all"` will remove all of the above.

Value

Returns `TRUE` invisibly if cache has been cleared.

Examples

```
nfl4th_clear_cache()
```

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