Package 'nfl4th'

August 11, 2022

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

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

Depends R (>= 2.10)

Imports dplyr, glue, httr, janitor, jsonlite, 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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Repository CRAN

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R topics documented:

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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

```
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)
```

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