ATP Data Analysis

2024-01-10

Instalacija potrebnih paketa.

```
# install.packages("dplyr")
# install.packages("lubridate")
# install.packages("ggplot2")
# install.packages("caret")
```

Učitavanje biblioteka.

```
library(dplyr)
```

```
##
## Attaching package: 'dplyr'
```

```
## The following objects are masked from 'package:stats':
##
##     filter, lag
```

```
## The following objects are masked from 'package:base':
##
##     intersect, setdiff, setequal, union
```

```
library(lubridate)
```

```
##
## Attaching package: 'lubridate'
```

```
## The following objects are masked from 'package:base':
##
##     date, intersect, setdiff, union
```

```
library(ggplot2)
library(caret)
```

```
## Loading required package: lattice
```

```
library(nortest)
```

Učitavanje i opis podataka

```
all_matches <- data.frame()
for (year in 1991:2023) {
  file_name <- paste0("dataset/atp_matches_", year, ".csv")
  matches_year <- read.csv(file_name, stringsAsFactors = FALSE)
  all_matches <- rbind(all_matches, matches_year)
}

print(head(all_matches))
```

```
##   tourney_id tourney_name surface draw_size tourney_level tourney_date
## 1   1991-339     Adelaide    Hard        32             A     19901231
```

```
## 2   1991-339     Adelaide    Hard        32             A     19901231
## 3   1991-339     Adelaide    Hard        32             A     19901231
## 4   1991-339     Adelaide    Hard        32             A     19901231
## 5   1991-339     Adelaide    Hard        32             A     19901231
## 6   1991-339     Adelaide    Hard        32             A     19901231
##   match_num winner_id winner_seed winner_entry          winner_name winner_hand
## 1         1    101723          NA                    Magnus Larsson           R
## 2         2    100946          NA            Q Slobodan Zivojinovic           R
## 3         3    101234          NA                      Patrik Kuhnen          R
## 4         4    101889           8                   Todd Woodbridge           R
## 5         5    101274          NA                     Udo Riglewski           R
## 6         6    102148          NA                   Fabrice Santoro           R
##   winner_ht winner_ioc winner_age loser_id loser_seed loser_entry
## 1       193        SWE       20.7   101414          1
## 2       198        YUG       27.4   101256         NA
## 3       190        GER       24.8   101421         NA
## 4       178        AUS       19.7   101703         NA
## 5       185        GER       24.4   101843          4
## 6       178        FRA       18.0   101285         NA
##         loser_name loser_hand loser_ht loser_ioc loser_age          score
## 1     Boris Becker          R      190       GER      23.1 6-4 3-6 7-6(2)
## 2   Mark Kratzmann          L      178       AUS      24.6 6-3 3-6 7-6(6)
## 3   Veli Paloheimo          R      183       FIN      23.0        6-0 6-4
## 4  Guillaume Raoux          R      180       FRA      20.8     7-6(2) 6-1
## 5   Sergi Bruguera          R      188       ESP      19.9        7-5 6-3
## 6 Thierry Champion          R      183       FRA      24.3        6-2 6-3
##   best_of round minutes w_ace w_df w_svpt w_1stIn w_1stWon w_2ndWon w_SvGms
## 1       3   R32     130     6    2     96      55       39       25      15
## 2       3   R32     119    19    4    101      56       45       25      15
## 3       3   R32      71     6    1     54      31       24       13       8
## 4       3   R32      85     2    0     60      40       30       14       9
## 5       3   R32      90     4    2     72      40       33       14      10
## 6       3   R32      88     2    1     61      45       32        4       8
##   w_bpSaved w_bpFaced l_ace l_df l_svpt l_1stIn l_1stWon l_2ndWon l_SvGms
## 1         2         4     8    3     95      62       44       23      16
## 2         9        10     8    2     84      41       35       27      15
## 3         1         1     2    2     60      37       22        6       8
## 4         3         3     3    3     74      45       30       11      10
## 5         7         8     2    2     77      41       28       15      11
## 6         7         9     1    0     62      45       20        8       9
##   l_bpSaved l_bpFaced winner_rank winner_rank_points loser_rank
## 1         6         8          56                 NA          2
## 2         1         2         304                 NA         75
## 3         4         8          82                 NA         69
## 4         5         8          50                 NA         84
## 5         4         8          88                 NA         28
## 6        10        16          62                 NA         59
##   loser_rank_points
## 1                NA
## 2                NA
## 3                NA
## 4                NA
## 5                NA
## 6                NA
```

TODO Opis ispisa

```
print(names(all_matches))
```

```
##  [1] "tourney_id"         "tourney_name"       "surface"
##  [4] "draw_size"          "tourney_level"      "tourney_date"
##  [7] "match_num"          "winner_id"          "winner_seed"
## [10] "winner_entry"       "winner_name"        "winner_hand"
## [13] "winner_ht"          "winner_ioc"         "winner_age"
## [16] "loser_id"           "loser_seed"         "loser_entry"
## [19] "loser_name"         "loser_hand"         "loser_ht"
## [22] "loser_ioc"          "loser_age"          "score"
## [25] "best_of"            "round"              "minutes"
## [28] "w_ace"              "w_df"               "w_svpt"
## [31] "w_1stIn"            "w_1stWon"           "w_2ndWon"
## [34] "w_SvGms"            "w_bpSaved"          "w_bpFaced"
## [37] "l_ace"              "l_df"               "l_svpt"
## [40] "l_1stIn"            "l_1stWon"           "l_2ndWon"
## [43] "l_SvGms"            "l_bpSaved"          "l_bpFaced"
## [46] "winner_rank"        "winner_rank_points" "loser_rank"
## [49] "loser_rank_points"
```

TODO Opis ispisa

```
print(summary(all_matches))
```

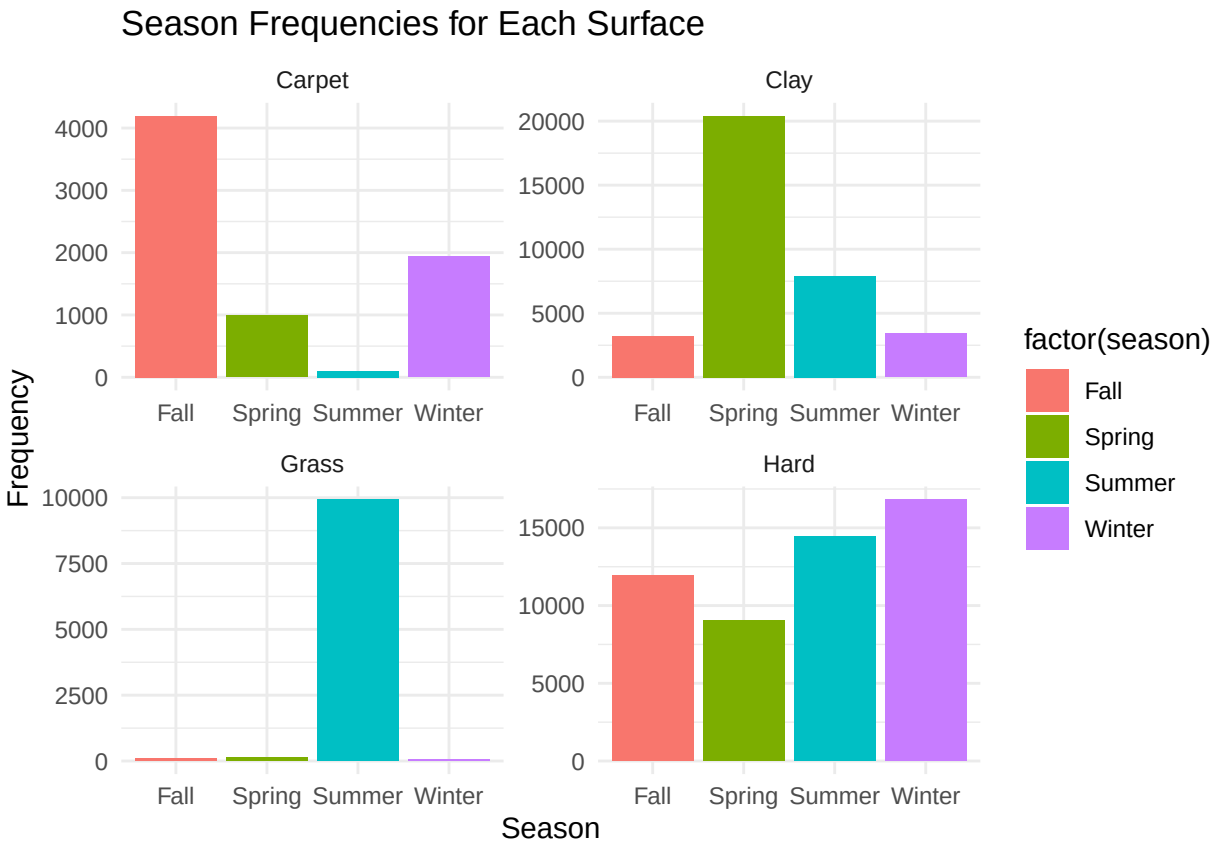
```
##   tourney_id        tourney_name         surface            draw_size
##  Length:104682      Length:104682      Length:104682      Min.   :  2.00
##  Class :character   Class :character   Class :character   1st Qu.: 32.00
##  Mode  :character   Mode  :character   Mode  :character   Median : 32.00
##                                                           Mean   : 53.52
##                                                           3rd Qu.: 64.00
##                                                           Max.   :128.00
##
##  tourney_level       tourney_date        match_num         winner_id
##  Length:104682      Min.   :19901231   Min.   :   1.00   Min.   :100284
##  Class :character   1st Qu.:19971006   1st Qu.:  10.00   1st Qu.:102148
##  Mode  :character   Median :20050815   Median :  24.00   Median :103602
##                     Mean   :20058134   Mean   :  72.47   Mean   :106703
##                     3rd Qu.:20140224   3rd Qu.:  73.00   3rd Qu.:104797
##                     Max.   :20230828   Max.   :1701.00   Max.   :211468
##
##   winner_seed    winner_entry       winner_name        winner_hand
##  Min.   : 1.00   Length:104682      Length:104682      Length:104682
##  1st Qu.: 3.00   Class :character   Class :character   Class :character
##  Median : 5.00   Mode  :character   Mode  :character   Mode  :character
##  Mean   : 6.92
##  3rd Qu.: 8.00
##  Max.   :35.00
##  NA's   :62282
##    winner_ht      winner_ioc          winner_age       loser_id
##  Min.   :160.0   Length:104682      Min.   :14.30   Min.   :100282
##  1st Qu.:180.0   Class :character   1st Qu.:23.00   1st Qu.:102154
##  Median :185.0   Mode  :character   Median :25.50   Median :103566
##  Mean   :185.7                      Mean   :25.77   Mean   :106814
##  3rd Qu.:190.0                      3rd Qu.:28.30   3rd Qu.:104919
```

```
##  Max.   :211.0                     Max.   :42.70   Max.   :212041
##  NA's   :2454                      NA's   :5
##    loser_seed    loser_entry         loser_name         loser_hand
##  Min.   : 1.00   Length:104682      Length:104682      Length:104682
##  1st Qu.: 4.00   Class :character   Class :character   Class :character
##  Median : 6.00   Mode  :character   Mode  :character   Mode  :character
##  Mean   : 8.29
##  3rd Qu.:11.00
##  Max.   :35.00
##  NA's   :81382
##     loser_ht      loser_ioc           loser_age        score
##  Min.   :160.0   Length:104682      Min.   :14.50   Length:104682
##  1st Qu.:180.0   Class :character   1st Qu.:23.00   Class :character
##  Median :185.0   Mode  :character   Median :25.70   Mode  :character
##  Mean   :185.2                      Mean   :25.88
##  3rd Qu.:190.0                      3rd Qu.:28.50
##  Max.   :211.0                      Max.   :46.00
##  NA's   :4855                       NA's   :18
##     best_of         round              minutes           w_ace
##  Min.   :3.000   Length:104682      Min.   :   0.0   Min.   :  0.000
##  1st Qu.:3.000   Class :character   1st Qu.:  75.0   1st Qu.:  3.000
##  Median :3.000   Mode  :character   Median :  96.0   Median :  5.000
##  Mean   :3.441                      Mean   : 103.8   Mean   :  6.526
##  3rd Qu.:3.000                      3rd Qu.: 125.0   3rd Qu.:  9.000
##  Max.   :5.000                      Max.   :1146.0   Max.   :113.000
##                                     NA's   :13036    NA's   :10207
##       w_df            w_svpt          w_1stIn          w_1stWon
##  Min.   : 0.000   Min.   :  0.00   Min.   :  0.00   Min.   :  0.00
##  1st Qu.: 1.000   1st Qu.: 56.00   1st Qu.: 34.00   1st Qu.: 26.00
##  Median : 2.000   Median : 73.00   Median : 44.00   Median : 33.00
##  Mean   : 2.734   Mean   : 78.13   Mean   : 47.66   Mean   : 35.93
##  3rd Qu.: 4.000   3rd Qu.: 94.00   3rd Qu.: 58.00   3rd Qu.: 43.00
##  Max.   :26.000   Max.   :491.00   Max.   :361.00   Max.   :292.00
##  NA's   :10207    NA's   :10207    NA's   :10207    NA's   :10207
##     w_2ndWon        w_SvGms        w_bpSaved        w_bpFaced
##  Min.   : 0.00   Min.   : 0.00   Min.   : 0.000   Min.   : 0.000
##  1st Qu.:12.00   1st Qu.: 9.00   1st Qu.: 1.000   1st Qu.: 2.000
##  Median :16.00   Median :11.00   Median : 3.000   Median : 4.000
##  Mean   :16.73   Mean   :12.41   Mean   : 3.526   Mean   : 5.164
##  3rd Qu.:21.00   3rd Qu.:15.00   3rd Qu.: 5.000   3rd Qu.: 7.000
##  Max.   :82.00   Max.   :90.00   Max.   :24.000   Max.   :34.000
##  NA's   :10207   NA's   :10206   NA's   :10207    NA's   :10207
##      l_ace             l_df            l_svpt          l_1stIn
##  Min.   :  0.000   Min.   : 0.000   Min.   :  0.00   Min.   :  0.00
##  1st Qu.:  2.000   1st Qu.: 2.000   1st Qu.: 59.00   1st Qu.: 34.00
##  Median :  4.000   Median : 3.000   Median : 76.00   Median : 45.00
##  Mean   :  4.841   Mean   : 3.485   Mean   : 80.97   Mean   : 48.09
##  3rd Qu.:  7.000   3rd Qu.: 5.000   3rd Qu.: 97.00   3rd Qu.: 58.00
##  Max.   :103.000   Max.   :26.000   Max.   :489.00   Max.   :328.00
##  NA's   :10207     NA's   :10207    NA's   :10207    NA's   :10207
##     l_1stWon         l_2ndWon         l_SvGms        l_bpSaved
##  Min.   :  0.00   Min.   :  0.00   Min.   : 0.00   Min.   :-6.000
##  1st Qu.: 22.00   1st Qu.: 10.00   1st Qu.: 9.00   1st Qu.: 2.000
##  Median : 30.00   Median : 14.00   Median :11.00   Median : 4.000
```

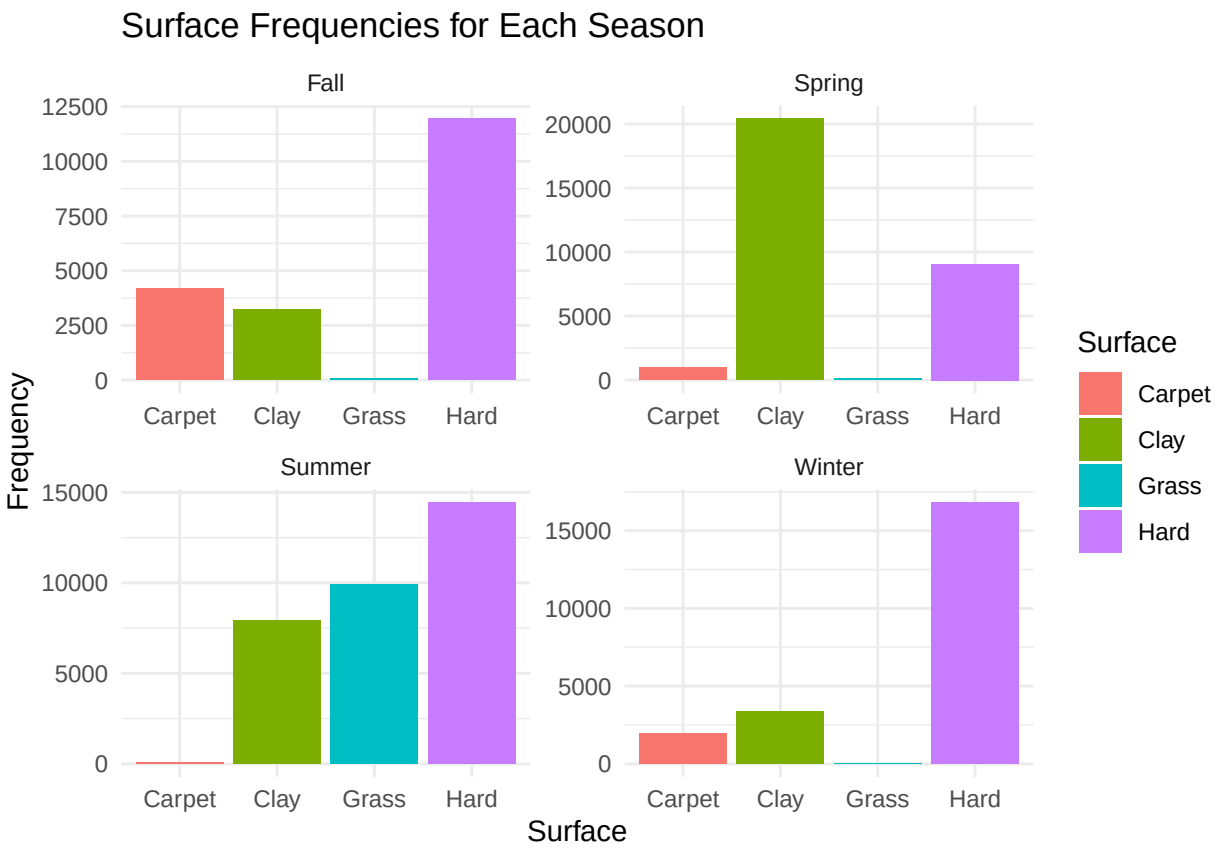
```
##  Mean   : 31.95   Mean   : 14.98   Mean   :12.21   Mean   : 4.813
##  3rd Qu.: 40.00   3rd Qu.: 19.00   3rd Qu.:15.00   3rd Qu.: 7.000
##  Max.   :284.00   Max.   :101.00   Max.   :91.00   Max.   :28.000
##  NA's   :10207    NA's   :10207    NA's   :10206   NA's   :10207
##    l_bpFaced      winner_rank      winner_rank_points   loser_rank
##  Min.   : 0.00   Min.   :   1.00   Min.   :    1      Min.   :   1.0
##  1st Qu.: 6.00   1st Qu.:  18.00   1st Qu.:  529      1st Qu.:  37.0
##  Median : 8.00   Median :  46.00   Median :  880      Median :  70.0
##  Mean   : 8.74   Mean   :  80.66   Mean   : 1429      Mean   : 119.1
##  3rd Qu.:11.00   3rd Qu.:  89.00   3rd Qu.: 1598      3rd Qu.: 119.0
##  Max.   :38.00   Max.   :2101.00   Max.   :16950      Max.   :2159.0
##  NA's   :10207   NA's   :1189      NA's   :2177       NA's   :2536
##  loser_rank_points
##  Min.   :    1.0
##  1st Qu.:  395.0
##  Median :  658.0
##  Mean   :  895.6
##  3rd Qu.: 1040.0
##  Max.   :16950.0
##  NA's   :3519
```

TODO Opis ispisa, možda uzet summary samo za neke značajke

Zadatak 1. Kakva je distribucija mečeva na specifičnim podlogama u različitim godišnjim dobima?

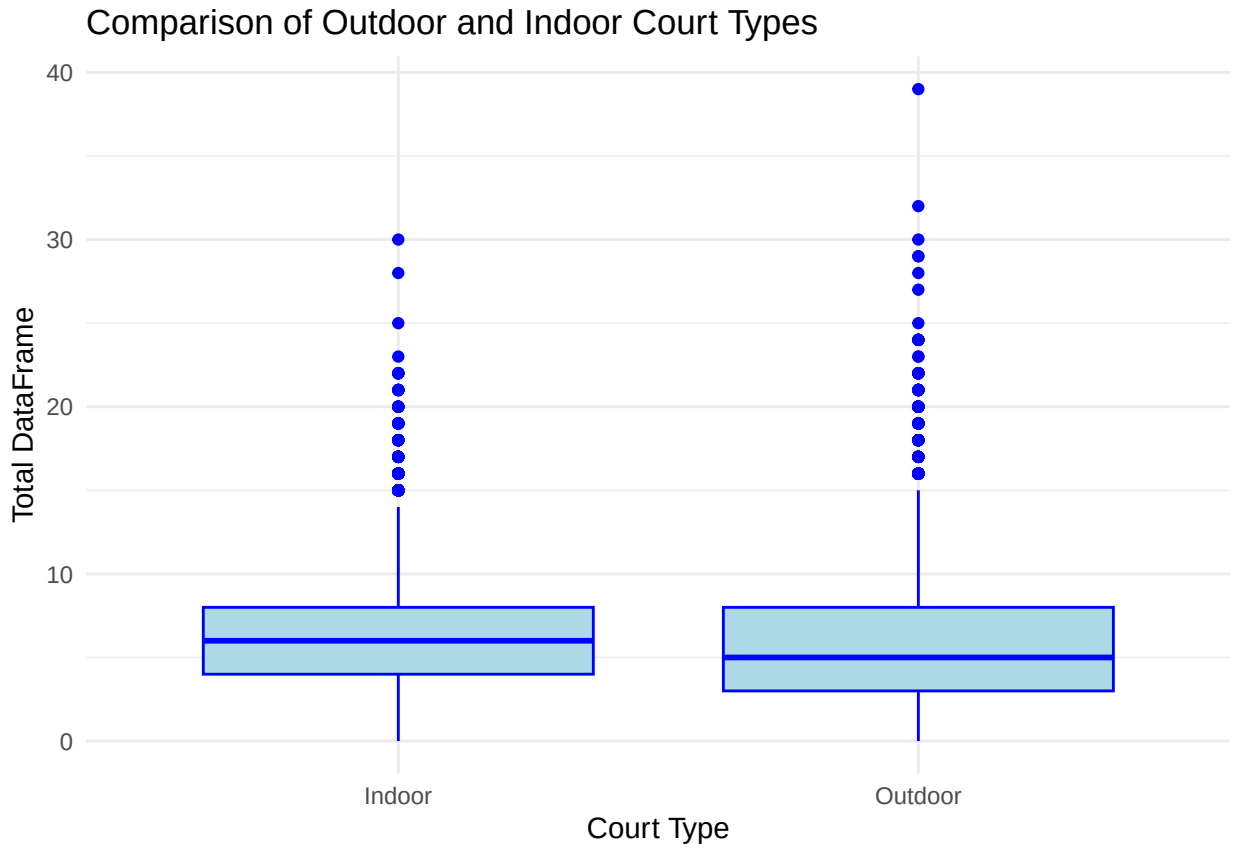


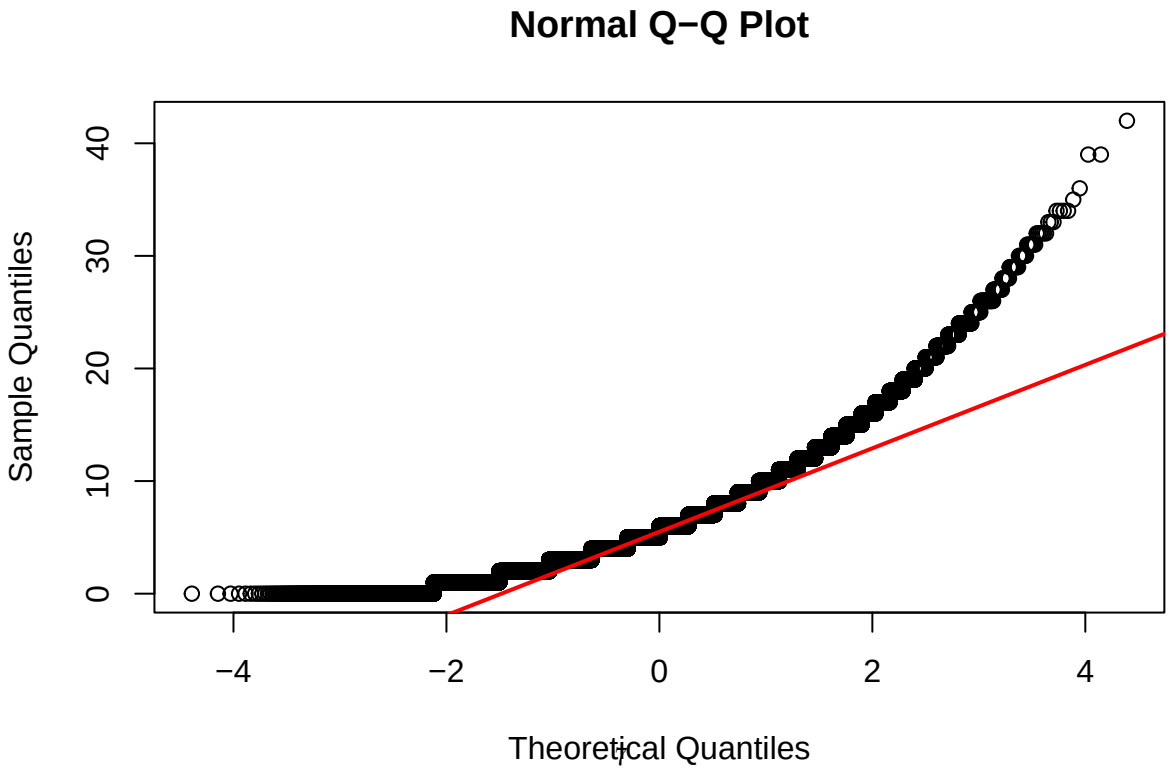
TODO Opisat histogram, šta prikazuje

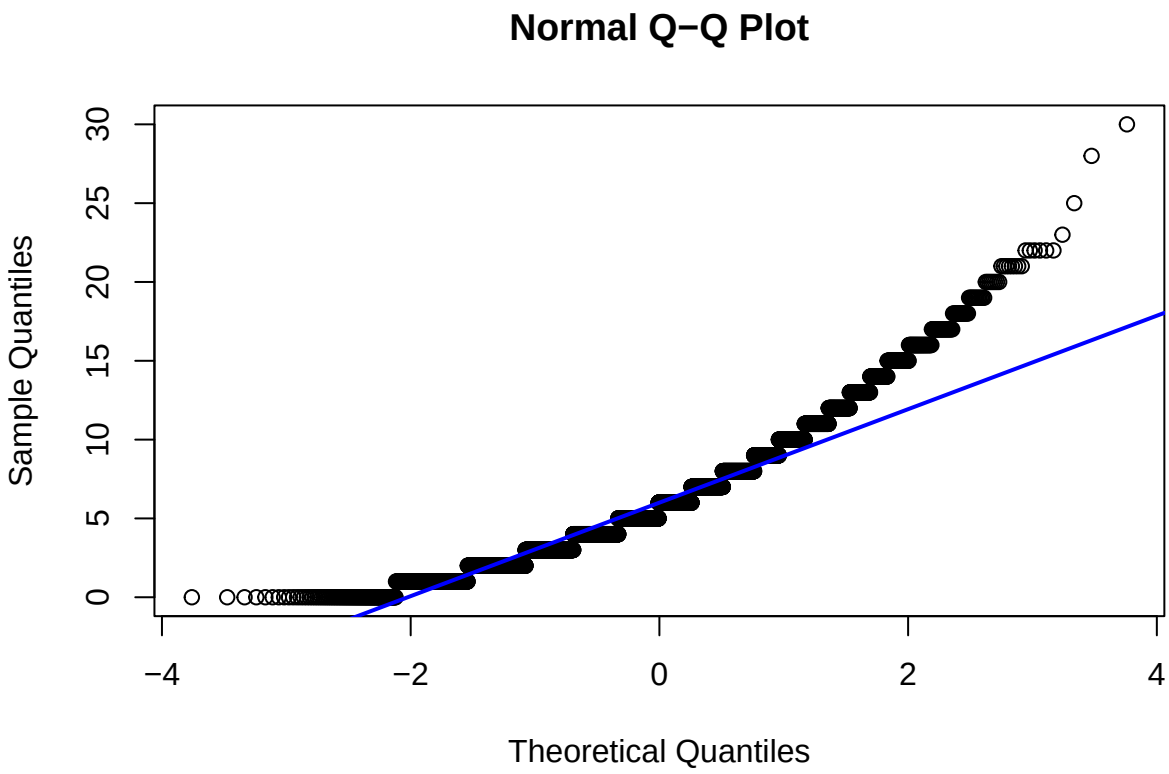


TODO Opisat histogram, šta prikazuje

Zadatak 2. **Postoji li značajna razlika u prosječnom broju dvostrukih pogrešaka između mečeva odigranih na otvorenom u odnosu na mečeve odigrane na zatvorenom terenu?**








```
##
##  Lilliefors (Kolmogorov-Smirnov) normality test
##
## data:  open_surface_data
## D = 0.12974, p-value < 2.2e-16
```

```
##
##  Lilliefors (Kolmogorov-Smirnov) normality test
##
## data:  closed_surface_data
## D = 0.12216, p-value < 2.2e-16
```

```
##
##  F test to compare two variances
##
## data:  open_surface_data and closed_surface_data
## F = 1.1441, num df = 88596, denom df = 5877, p-value = 4.316e-12
## alternative hypothesis: true ratio of variances is not equal to 1
## 95 percent confidence interval:
##  1.101871 1.187308
## sample estimates:
## ratio of variances
##           1.144146
```

```
##
##  Wilcoxon rank sum test with continuity correction
##
## data:  open_surface_data and closed_surface_data
```

```
## W = 258377269, p-value = 0.3191
## alternative hypothesis: true location shift is not equal to 0
```

```
##
##  Two Sample t-test
##
## data:  open_surface_data and closed_surface_data
## t = 0.8201, df = 94473, p-value = 0.4122
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -0.06059204  0.14777857
## sample estimates:
## mean of x mean of y
##  6.221035  6.177441
```

TODO Opis ispisa

Zadatak 3. Ima li razlike u broju serviranih asova na različitim podlogama?

```
##                Df  Sum Sq Mean Sq F value Pr(>F)
## surface         3  754563  251521    4319 <2e-16 ***
## Residuals   94471 5501707      58
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

TODO Opis ispisa

Zadatak 4. Kakva je veza između vrste terena i vjerojatnosti da će mečevi otići u peti set?

```
##
##          FALSE TRUE
##   Carpet   700  179
##   Clay    5550 1240
##   Grass   3471  819
##   Hard    9090 2054
```

TODO Opis ispisa

```
##
##  Pearson's Chi-squared test
##
## data:  contingency_table
## X-squared = 3.2059, df = 3, p-value = 0.361
```

TODO Opis ispisa

Zadatak 5. Možemo li procijeniti broj asova koje će igrač odservirati u tekućoj godini (zadnjoj dostupnoj sezoni) na temelju njegovih rezultata iz prethodnih sezona?

```
## Warning: Using an external vector in selections was deprecated in tidyselect 1.1.0.
## i Please use `all_of()` or `any_of()` instead.
##   # Was:
##   data %>% select(features)
##
##   # Now:
```

```
##   data %>% select(all_of(features))
##
## See <https://tidyselect.r-lib.org/reference/faq-external-vector.html>.
## This warning is displayed once every 8 hours.
## Call `lifecycle::last_lifecycle_warnings()` to see where this warning was
## generated.
```

```
## `summarise()` has grouped output by 'player_id', 'year', 'winner_ht'. You can
## override using the `.groups` argument.
## `summarise()` has grouped output by 'player_id', 'year', 'loser_ht'. You can
## override using the `.groups` argument.
```

```
## # A tibble: 7,417 x 9
## # Groups:   player_id, year, height [7,417]
##    player_id  year height hand  total_aces avg_1stIn avg_1stWon  svpt    df
##        <int> <dbl>  <int> <fct>      <int>     <dbl>      <dbl> <dbl> <int>
##  1    100284  1991    178 L             45      60.3       40.5  90.4    38
##  2    100284  1992    178 L             37      53.6       36.1  80.3    31
##  3    100284  1993    178 L              4      57         40    92.3    11
##  4    100284  1994    178 L              2      61         36    89       5
##  5    100284  1995    178 L              7      43         31.5  78.5    10
##  6    100529  1991    185 R            168      45.3       36.2  81.2    43
##  7    100529  1992    185 R             87      38.3       30.5  78.3    47
##  8    100532  1991    175 R             17      33         26.3  66       8
##  9    100581  1991    180 L            205      39.0       30.8  69.9   123
## 10    100581  1992    180 L            175      50.6       40.3  86.3   126
## # i 7,407 more rows
```

```
## # A tibble: 10,396 x 9
## # Groups:   player_id, year, height [10,396]
##    player_id  year height hand  total_aces avg_1stIn avg_1stWon  svpt    df
##        <int> <dbl>  <int> <fct>      <int>     <dbl>      <dbl> <dbl> <int>
##  1    100282  1992    180 L              0      67.5       40.5  96       5
##  2    100284  1991    178 L              9      49.2       27.1  75.6    34
##  3    100284  1992    178 L             25      57.9       33.4  90.6    46
##  4    100284  1993    178 L              4      37.4       22.2  60.4    14
##  5    100284  1994    178 L              1      56         34    87.3     3
##  6    100284  1995    178 L              3      48         29    67       2
##  7    100284  1996    178 L              3      55         30    93       2
##  8    100286  1991    168 R              0      32         18    60       2
##  9    100321  1993    193 R              0      34         14    48       0
## 10    100431  1992    178 R              8      46.5       30.5  76       4
## # i 10,386 more rows
```

```
## # A tibble: 40 x 9
## # Groups:   player_id, year, height [20]
##    player_id  year height hand  total_aces avg_1stIn avg_1stWon  svpt    df
##        <int> <dbl>  <int> <fct>      <int>     <dbl>      <dbl> <dbl> <int>
##  1    104925  2004    188 R              4      60         39    91       2
##  2    104925  2005    188 R             43      62.1       45.4  96.4    26
##  3    104925  2006    188 R            216      49.3       37    79.3    92
##  4    104925  2007    188 R            420      54.2       40.0  83.5   147
##  5    104925  2008    188 R            413      47.3       35.6  72.3   113
##  6    104925  2009    188 R            420      46.2       34.3  73.0   212
##  7    104925  2010    188 R            232      49.2       35.9  77.5   198
##  8    104925  2011    188 R            320      47.0       35.2  71.9   131
```

```
##  9    104925  2012    188 R           456      47.4       36.0  73.6   117
## 10    104925  2013    188 R           424      47.5       36.6  72.4    94
## 11    104925  2014    188 R           371      50.8       38.5  75.9    91
## 12    104925  2015    188 R           441      48.5       36.4  72.9   124
## 13    104925  2016    188 R           263      48.6       36.2  74.5   168
## 14    104925  2017    188 R           138      51.0       37.8  76.6    56
## 15    104925  2018    188 R           286      50.2       38.2  75.7   117
## 16    104925  2019    188 R           332      46.2       36.4  70.4   136
## 17    104925  2020    188 R           257      50.5       38.5  78.4   125
## 18    104925  2021    188 R           416      55.7       43.1  85.4   130
## 19    104925  2022    188 R           244      46.0       36.7  70.1    66
## 20    104925  2023    188 R           295      53.8       42.2  84.9   128
## 21    104925  2004    188 R            22      57.3       34    93.7    19
## 22    104925  2005    188 R            45      57         37.6  91.3    32
## 23    104925  2006    188 R            63      52.3       34.2  82.2    59
## 24    104925  2007    188 R            98      49         32.2  79.9    48
## 25    104925  2008    188 R            73      53.8       36.6  84.6    40
## 26    104925  2009    188 R            82      53.9       35.9  86.8    51
## 27    104925  2010    188 R            72      61.1       39.9  93.1    84
## 28    104925  2011    188 R            23      57.2       36.6  88.4    12
## 29    104925  2012    188 R            46      54         37.2  87.4    30
## 30    104925  2013    188 R            52      73.1       47.2 110.     24
## 31    104925  2014    188 R            57      60         41.5  91.4    14
## 32    104925  2015    188 R            30      60.2       39.8  91.8    11
## 33    104925  2016    188 R            38      51.8       35    82.1    20
## 34    104925  2017    188 R            31      57.8       38.6  90.1    23
## 35    104925  2018    188 R            56      57.4       38.8  87.1    35
## 36    104925  2019    188 R            60      61.4       40.3  91.3    32
## 37    104925  2020    188 R            21      45.6       31.2  72      12
## 38    104925  2021    188 R            31      56.4       39.6  92      18
## 39    104925  2022    188 R            38      69         45.2 106      22
## 40    104925  2023    188 R            15      66         41   100.     15
```

```
## `summarise()` has grouped output by 'player_id', 'year', 'height'. You can
## override using the `.groups` argument.
```

```
## # A tibble: 20 x 9
## # Groups:   player_id, year, height [20]
##    player_id  year height hand  total_aces avg_1stIn avg_1stWon  svpt    df
##        <int> <dbl>  <int> <fct>      <int>     <dbl>      <dbl> <dbl> <int>
##  1    104925  2004    188 R             26      58.7       36.5  92.3    21
##  2    104925  2005    188 R             88      59.6       41.5  93.9    58
##  3    104925  2006    188 R            279      50.8       35.6  80.8   151
##  4    104925  2007    188 R            518      51.6       36.1  81.7   195
##  5    104925  2008    188 R            486      50.5       36.1  78.4   153
##  6    104925  2009    188 R            502      50.0       35.1  79.9   263
##  7    104925  2010    188 R            304      55.1       37.9  85.3   282
##  8    104925  2011    188 R            343      52.1       35.9  80.2   143
##  9    104925  2012    188 R            502      50.7       36.6  80.5   147
## 10    104925  2013    188 R            476      60.3       41.9  91.0   118
## 11    104925  2014    188 R            428      55.4       40.0  83.6   105
## 12    104925  2015    188 R            471      54.3       38.1  82.4   135
## 13    104925  2016    188 R            301      50.2       35.6  78.3   188
## 14    104925  2017    188 R            169      54.4       38.2  83.4    79
## 15    104925  2018    188 R            342      53.8       38.5  81.4   152
```

```
## 16    104925  2019    188 R            392      53.8       38.3  80.8   168
## 17    104925  2020    188 R            278      48.1       34.8  75.2   137
## 18    104925  2021    188 R            447      56.0       41.4  88.7   148
## 19    104925  2022    188 R            282      57.5       40.9  88.1    88
## 20    104925  2023    188 R            310      59.9       41.6  92.6   143
```

```
## # A tibble: 20 x 10
## # Groups:   player_id, year, height [20]
##    player_id  year height hand  total_aces avg_1stIn avg_1stWon  svpt    df
##        <int> <dbl>  <int> <fct>      <int>     <dbl>      <dbl> <dbl> <int>
##  1    104925  2004    188 R             26      58.7       36.5  92.3    21
##  2    104925  2005    188 R             88      59.6       41.5  93.9    58
##  3    104925  2006    188 R            279      50.8       35.6  80.8   151
##  4    104925  2007    188 R            518      51.6       36.1  81.7   195
##  5    104925  2008    188 R            486      50.5       36.1  78.4   153
##  6    104925  2009    188 R            502      50.0       35.1  79.9   263
##  7    104925  2010    188 R            304      55.1       37.9  85.3   282
##  8    104925  2011    188 R            343      52.1       35.9  80.2   143
##  9    104925  2012    188 R            502      50.7       36.6  80.5   147
## 10    104925  2013    188 R            476      60.3       41.9  91.0   118
## 11    104925  2014    188 R            428      55.4       40.0  83.6   105
## 12    104925  2015    188 R            471      54.3       38.1  82.4   135
## 13    104925  2016    188 R            301      50.2       35.6  78.3   188
## 14    104925  2017    188 R            169      54.4       38.2  83.4    79
## 15    104925  2018    188 R            342      53.8       38.5  81.4   152
## 16    104925  2019    188 R            392      53.8       38.3  80.8   168
## 17    104925  2020    188 R            278      48.1       34.8  75.2   137
## 18    104925  2021    188 R            447      56.0       41.4  88.7   148
## 19    104925  2022    188 R            282      57.5       40.9  88.1    88
## 20    104925  2023    188 R            310      59.9       41.6  92.6   143
## # i 1 more variable: aces_in_following_year <int>
```

```
##        1        2        3        4
## 415.2551 508.1003 382.2384 331.1461
```