# Trabalho

## 2025-07-02

### Análise dos dados

```r
load("bfd_2022.rdata")
```

Abaixo o summary da base de dados:

```r
summary(bfd)
```

```
##    arrival            depart             route            company
##  Length:845160      Length:845160      Length:845160      Length:845160
##  Class :character   Class :character   Class :character   Class :character
##  Mode  :character   Mode  :character   Mode  :character   Mode  :character
##
##
##
##
##    flight             di                type
##  Length:845160      Length:845160      Length:845160
##  Class :character   Class :character   Class :character
##  Mode  :character   Mode  :character   Mode  :character
##
##
##
##
##    depart_day_period      arrival_day_period expected_depart
##  Night        : 85081   Night        :100822   Min.   :2022-01-01 00:05:00
##  Early Morning:165463   Early Morning:137982   1st Qu.:2022-04-09 07:45:00
##  Mid Morning  : 94069   Mid Morning  : 84877   Median :2022-07-13 05:00:00
##  Late Morning : 87431   Late Morning : 97092   Mean   :2022-07-08 23:42:38
##  Afternoon    :165178   Afternoon    :178550   3rd Qu.:2022-10-08 18:31:15
##  Early Evening:141867   Early Evening:129243   Max.   :2023-01-01 21:30:00
##  Late Evening :106071   Late Evening :116594
##   real_depart                   expected_arrival
##  Min.   :2021-12-31 23:50:00   Min.   :2022-01-01 01:20:00
##  1st Qu.:2022-04-08 19:03:00   1st Qu.:2022-04-09 09:50:00
##  Median :2022-07-12 13:45:00   Median :2022-07-13 07:25:00
##  Mean   :2022-07-08 10:20:13   Mean   :2022-07-09 02:08:51
##  3rd Qu.:2022-10-07 14:58:00   3rd Qu.:2022-10-08 21:06:15
##  Max.   :2023-01-01 20:07:00   Max.   :2023-01-02 09:25:00
##  NA's   :34984
##   real_arrival                  status_depart      status_arrival
##  Min.   :2022-01-01 01:05:00   Length:845160      Length:845160
##  1st Qu.:2022-04-08 21:06:00   Class :character   Class :character
##  Median :2022-07-12 15:59:00   Mode  :character   Mode  :character
##  Mean   :2022-07-08 12:42:06
##  3rd Qu.:2022-10-07 17:05:00
```

```
##  Max.   :2023-01-02 00:26:00
##  NA's   :34984
##  observation    delay_depart     delay_arrival    expected_flight_length
##  Mode:logical   Min.   :-2040.000   Min.   :-2032.00   Min.   :  10.0
##  NA's:845160    1st Qu.:   -7.000   1st Qu.:  -11.00   1st Qu.:  75.0
##                 Median :   -2.000   Median :   -4.00   Median : 100.0
##                 Mean   :    5.356   Mean   :    2.57   Mean   : 146.2
##                 3rd Qu.:    6.000   3rd Qu.:    7.00   3rd Qu.: 165.0
##                 Max.   :44873.000   Max.   :44838.00   Max.   :1400.0
##                 NA's   :34984       NA's   :34984
##  real_flight_length outlier_depart_delay outlier_arrival_delay
##  Min.   :   0.0     Mode :logical        Mode :logical
##  1st Qu.:  73.0     FALSE:809858         FALSE:809867
##  Median :  99.0     TRUE :318            TRUE :309
##  Mean   : 141.9     NA's :34984          NA's :34984
##  3rd Qu.: 159.0
##  Max.   :2285.0
##  NA's   :34984
##  outlier_expected_flight_consistency outlier_real_flight_consistency
##  Mode :logical                       Mode :logical
##  FALSE:845160                        FALSE:810176
##                                      NA's :34984
##
##
##
##
##  outlier_expected_flight_length outlier_real_flight_length
##  Mode :logical                  Mode :logical
##  FALSE:815630                   FALSE:805264
##  TRUE :29530                    TRUE :4912
##                                 NA's :34984
##
##
##
##  depart_air_temperature depart_dew_point depart_relative_humidity
##  Min.   : 1.0           Min.   :-7.0     Min.   :  9.72
##  1st Qu.:19.0           1st Qu.:14.0     1st Qu.: 62.03
##  Median :23.0           Median :18.0     Median : 74.44
##  Mean   :22.9           Mean   :17.3     Mean   : 73.29
##  3rd Qu.:27.0           3rd Qu.:21.0     3rd Qu.: 88.09
##  Max.   :45.0           Max.   :33.0     Max.   :100.00
##  NA's   :83934          NA's   :84997    NA's   :84997
##  depart_wind_direction depart_wind_speed depart_sky_coverage depart_pressure
##  Min.   :  0.0         Min.   : 0.00     Length:845160       Min.   : 0.50
##  1st Qu.: 80.0         1st Qu.: 4.00     Class :character    1st Qu.:29.91
##  Median :130.0         Median : 6.00     Mode  :character    Median :30.00
##  Mean   :151.1         Mean   : 6.79                         Mean   :30.00
##  3rd Qu.:200.0         3rd Qu.: 9.00                         3rd Qu.:30.09
##  Max.   :360.0         Max.   :82.00                         Max.   :32.72
##  NA's   :112521        NA's   :83674                         NA's   :83718
##  depart_visibility depart_apparent_temperature   depart_wind_speed_scale
##  Min.   :0.000     Min.   :-1.183                Light Breeze  :244460
##  1st Qu.:6.210     1st Qu.:19.000                Gentle Breeze :239504
##  Median :6.210     Median :23.000                Light Air     :121902
```

```
##  Mean   :5.914    Mean   :23.532         Moderate Breeze:114007
##  3rd Qu.:6.210    3rd Qu.:27.478         Calm           : 31116
##  Max.   :6.210    Max.   :76.050         (Other)        : 10497
##  NA's   :83453    NA's   :84997          NA's           : 83674
##  depart_wind_direction_cat arrival_air_temperature arrival_dew_point
##  E      :107995            Min.   : 1.00           Min.   :-10.00
##  ESE    : 82685            1st Qu.:19.00           1st Qu.: 14.00
##  SE     : 74864            Median :23.00           Median : 18.00
##  SSE    : 66100            Mean   :22.97           Mean   : 17.27
##  N      : 61840            3rd Qu.:27.00           3rd Qu.: 21.00
##  (Other):339155           Max.   :41.00           Max.   : 34.00
##  NA's   :112521           NA's   :85460           NA's   :86537
##  arrival_relative_humidity arrival_wind_direction arrival_wind_speed
##  Min.   : 10.48            Min.   :  0.0          Min.   : 0.000
##  1st Qu.: 61.58            1st Qu.: 80.0          1st Qu.: 4.000
##  Median : 74.44            Median :130.0          Median : 6.000
##  Mean   : 72.96            Mean   :152.3          Mean   : 6.796
##  3rd Qu.: 88.09            3rd Qu.:200.0          3rd Qu.: 9.000
##  Max.   :100.00           Max.   :360.0          Max.   :99.000
##  NA's   :86537            NA's   :113150         NA's   :85239
##  arrival_sky_coverage arrival_pressure arrival_visibility
##  Length:845160        Min.   : 0.44    Min.   :0.000
##  Class :character     1st Qu.:29.91    1st Qu.:6.210
##  Mode  :character     Median :30.00    Median :6.210
##                       Mean   :30.00    Mean   :5.922
##                       3rd Qu.:30.09    3rd Qu.:6.210
##                       Max.   :56.46    Max.   :6.210
##                       NA's   :85251    NA's   :85010
##  arrival_apparent_temperature   arrival_wind_speed_scale
##  Min.   :-3.639                 Light Breeze   :243540
##  1st Qu.:19.000                 Gentle Breeze  :241538
##  Median :23.000                 Light Air      :119946
##  Mean   :23.594                 Moderate Breeze:112451
##  3rd Qu.:27.706                 Calm           : 31739
##  Max.   :65.511                 (Other)        : 10707
##  NA's   :86537                  NA's           : 85239
##  arrival_wind_direction_cat
##  E      :103711
##  ESE    : 79476
##  SE     : 75207
##  SSE    : 66990
##  S      : 61992
##  (Other):344634
##  NA's   :113150
```

A ideia é fazer a análise de cada variável individualmente.

**Arrival**

É o código do aeroporto de destino do voo.

```
table(bfd$arrival) %>%
    as.data.frame() %>%
    arrange(desc(Freq)) %>%
    rename(Aeroporto = Var1, Voos.Destino = Freq) %>%
```

```
    head(10)
```

```
##    Aeroporto Voos.Destino
## 1      SBGR       115625
## 2      SBSP        73167
## 3      SBKP        63141
## 4      SBBR        51007
## 5      SBRJ        48757
## 6      SBCF        44666
## 7      SBRF        36595
## 8      SBPA        28063
## 9      SBSV        26545
## 10     SBCT        24619
```

**Depart**

É o código do aeroporto de origem do voo.

```
table(bfd$depart) %>%
    as.data.frame() %>%
    arrange(desc(Freq)) %>%
    rename(Aeroporto = Var1, Voos.Origem = Freq) %>%
    head(10)
```

```
##    Aeroporto Voos.Origem
## 1      SBGR       114683
## 2      SBSP        72997
## 3      SBKP        63171
## 4      SBBR        50735
## 5      SBRJ        48636
## 6      SBCF        44612
## 7      SBRF        36643
## 8      SBPA        28090
## 9      SBSV        26663
## 10     SBCT        24594
```