Dataset Description

Imports

```
library(fairmodels)
library(tidymodels)
```

```
## -- Attaching packages --------------------------------------- tidymodels 0.2.0 --

## v broom        0.8.0     v recipes      0.2.0
## v dials        0.1.1     v rsample      0.1.1
## v dplyr        1.0.9     v tibble       3.1.7
## v ggplot2      3.3.6     v tidyr        1.2.0
## v infer        1.0.0     v tune         0.2.0
## v modeldata    0.1.1     v workflows    0.2.6
## v parsnip      0.2.1     v workflowsets 0.2.1
## v purrr        0.3.4     v yardstick    0.0.9

## -- Conflicts ------------------------------------------ tidymodels_conflicts() --
## x purrr::discard() masks scales::discard()
## x dplyr::filter()  masks stats::filter()
## x dplyr::lag()     masks stats::lag()
## x recipes::step()  masks stats::step()
## * Learn how to get started at https://www.tidymodels.org/start/
```

```
library(rpart)
```

```
##
## Attaching package: 'rpart'

## The following object is masked from 'package:dials':
##
##     prune
```

```
library(discrim)
```

```
##
## Attaching package: 'discrim'

## The following object is masked from 'package:dials':
##
##     smoothness
```

```
source("../scripts/metrics_on_dataset.R")
```

```
## -- Attaching packages --------------------------------------- tidyverse 1.3.1 --

## v readr   2.1.2     v forcats 0.5.1
## v stringr 1.4.0

## -- Conflicts ------------------------------------------ tidyverse_conflicts() --
## x readr::col_factor() masks scales::col_factor()
## x purrr::discard()    masks scales::discard()
## x dplyr::filter()     masks stats::filter()
## x stringr::fixed()    masks recipes::fixed()
## x dplyr::lag()        masks stats::lag()
## x readr::spec()       masks yardstick::spec()
```

The Dataset

```
df <- read_rds("../data/selection.rds")
df_test <- read_rds("../data/selection_test.rds")
head(df, 10)
```

```
##    nationality gender test_score english_cert extracurricular rating accepted
## 1    Non_Dutch Female        6.7        FALSE            TRUE    6.7    FALSE
## 2    Non_Dutch Female        8.8         TRUE            TRUE    8.8     TRUE
## 3    Non_Dutch Female        5.1        FALSE           FALSE    5.1    FALSE
## 4        Dutch Female        4.8        FALSE           FALSE    5.6    FALSE
## 5        Dutch   Male        6.4        FALSE           FALSE    7.2    FALSE
## 6    Non_Dutch   Male        7.1         TRUE           FALSE    7.1    FALSE
## 7    Non_Dutch   Male        4.9        FALSE           FALSE    4.9    FALSE
## 8        Dutch   Male        4.8        FALSE           FALSE    5.6    FALSE
## 9        Dutch Female        5.1        FALSE           FALSE    5.9    FALSE
## 10   Non_Dutch   Male        7.6        FALSE            TRUE    7.6    FALSE
```

Characteristics

Training dataset

```
summary(df)
```

```
##     nationality     gender      test_score     english_cert    extracurricular
##  Dutch    :497   Female:514   Min.   : 1.800   Mode :logical   Mode :logical
##  Non_Dutch:503   Male  :486   1st Qu.: 5.475   FALSE:666       FALSE:600
##                               Median : 6.500   TRUE :334       TRUE :400
##                               Mean   : 6.511
##                               3rd Qu.: 7.525
##                               Max.   :10.000
##      rating        accepted
```

```
##  Min.   : 2.400   Mode :logical
##  1st Qu.: 5.900   FALSE:837
##  Median : 6.950   TRUE :163
##  Mean   : 6.903
##  3rd Qu.: 7.900
##  Max.   :10.000
```

```
summary(filter(df, accepted))
```

```
##     nationality     gender     test_score     english_cert    extracurricular
##  Dutch    :107   Female:77   Min.   : 7.700   Mode :logical   Mode :logical
##  Non_Dutch: 56   Male  :86   1st Qu.: 8.200   FALSE:117       FALSE:102
##                              Median : 8.600   TRUE :46        TRUE :61
##                              Mean   : 8.684
##                              3rd Qu.: 9.050
##                              Max.   :10.000
##      rating       accepted
##  Min.   : 8.500   Mode:logical
##  1st Qu.: 8.800   TRUE:163
##  Median : 9.100
##  Mean   : 9.175
##  3rd Qu.: 9.600
##  Max.   :10.000
```

```
summary(filter(df, !accepted))
```

```
##     nationality     gender      test_score    english_cert    extracurricular
##  Dutch    :390   Female:437   Min.   :1.800   Mode :logical   Mode :logical
##  Non_Dutch:447   Male  :400   1st Qu.:5.200   FALSE:549       FALSE:498
##                               Median :6.200   TRUE :288       TRUE :339
##                               Mean   :6.088
##                               3rd Qu.:7.000
##                               Max.   :8.400
##      rating      accepted
##  Min.   :2.40   Mode :logical
##  1st Qu.:5.60   FALSE:837
##  Median :6.60
##  Mean   :6.46
##  3rd Qu.:7.40
##  Max.   :8.40
```

Test dataset

```
summary(df_test)
```

```
##     nationality     gender      test_score     english_cert    extracurricular
##  Dutch    :504   Female:487   Min.   : 1.400   Mode :logical   Mode :logical
##  Non_Dutch:496   Male  :513   1st Qu.: 5.500   FALSE:664       FALSE:599
##                               Median : 6.500   TRUE :336       TRUE :401
##                               Mean   : 6.479
```

```
##                                3rd Qu.: 7.500
##                                Max.   :10.000
##      rating        accepted
##  Min.   : 1.400   Mode :logical
##  1st Qu.: 5.900   FALSE:832
##  Median : 6.900   TRUE :168
##  Mean   : 6.876
##  3rd Qu.: 7.900
##  Max.   :10.000
```

Metrics on the Dataset

```
model <- decision_tree(mode = "classification")
results <- all_metrics(df, model, df_test)
print_all_metrics("Unmodified dataset", results)
```

```
## [1] "Unmodified dataset"
## [1] "Group fairness"
## # A tibble: 4 x 4
##   nationality accepted total  perc
##   <fct>       <lgl>    <int> <dbl>
## 1 Dutch       FALSE      390  78.5
## 2 Dutch       TRUE       107  21.5
## 3 Non_Dutch   FALSE      447  88.9
## 4 Non_Dutch   TRUE        56  11.1
## [1] "Causal discrimination"
## [1] 0.13
## [1] "Unawareness"
## # A tibble: 4 x 4
##   nationality predicted_accepted total  perc
##   <fct>       <fct>              <int> <dbl>
## 1 Dutch       FALSE                401  79.6
## 2 Dutch       TRUE                 103  20.4
## 3 Non_Dutch   FALSE                444  89.5
## 4 Non_Dutch   TRUE                  52  10.5
```