Abalone_Classification

2023-04-24

Neste trabalho analiso os dados de https://archive.ics.uci.edu/ml/datasets/abalone.

O abalone é um molusco gastrópode pertencente à família Haliotidae e é encontrado sob a forma de diversas espécies em águas costeiras de quase todo o mundo. Por causa de seu uso como jóia e alimento,há duas espécies de abalone que se encontram em risco de extinção.

Neste projeto, irei prever a idade do abalone baseada em fatores físicos.

A idade do abalone é determinada cortando a casca através do cone, manchando-a e contando o número de anéis através de um microscópio. Outras medidas, mais fáceis de obter, são usadas para prever a idade. Nome / Tipo de Dado / Unidade de Medida / Descrição

Sex (Sexo) / nominal / – / M, F e I (infantil) Length (Comprimento) / contínuo / mm / Medição mais longa da concha Diameter (Diâmetro) / contínuo / mm / Perpendicular ao comprimento Height (Altura) / contínuo / mm / Com carne na concha Whole weight (Peso total) / contínuo / gramas / Abalone inteiro Shucked weight (Peso da carne) / contínuo / gramas / Peso da carne Viscera weight (Peso das vísceras) / contínuo / gramas / Peso do intestino (após sangria) Shell weight (Peso da concha) / contínuo / gramas / Depois de seco Rings (Anéis) / inteiro / – / +1,5 dá a idade em anos

Bibliotecas

```
#install.packages("tidyverse")
#install.packages("ggplot2")
#install.packages("GGally")
#install.packages("ggcorrplot")
#install.packages("DataExplorer")
#install.packages("caret")
#install.packages("doParallel")
#install.packages("caret")
#install.packages("rpart.plot")
#install.packages("rpart")
#install.packages("VIM")
#install.packages("rattle")
#install.packages("RColorBrewer")
```

Chamada das Bibliotecas

```
library(tidyverse)
```

```
## -- Attaching core tidyverse packages ------------------------ tidyverse 2.0.0 --
## v dplyr     1.1.1     v readr     2.1.4
## v forcats   1.0.0     v stringr   1.5.0
## v ggplot2   3.4.2     v tibble    3.2.1
## v lubridate 1.9.2     v tidyr     1.3.0
## v purrr     1.0.1
## -- Conflicts ------------------------------------------ tidyverse_conflicts() --
```

```
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()    masks stats::lag()
## i Use the conflicted package (<http://conflicted.r-lib.org/>) to force all conflicts to become errors
```

```
library(ggplot2)
library(GGally)
```

```
## Registered S3 method overwritten by 'GGally':
##   method from
##   +.gg   ggplot2
```

```
library(ggcorrplot)
library(readr)
library(DataExplorer)
library(doParallel)
```

```
## Carregando pacotes exigidos: foreach
##
## Attaching package: 'foreach'
##
## The following objects are masked from 'package:purrr':
##
##     accumulate, when
##
## Carregando pacotes exigidos: iterators
## Carregando pacotes exigidos: parallel
```

```
library(caret)
```

```
## Carregando pacotes exigidos: lattice
##
## Attaching package: 'caret'
##
## The following object is masked from 'package:purrr':
##
##     lift
```

```
library(rpart)
library(rattle)
```

```
## Carregando pacotes exigidos: bitops
## Rattle: A free graphical interface for data science with R.
## Version 5.5.1 Copyright (c) 2006-2021 Togaware Pty Ltd.
## Type 'rattle()' to shake, rattle, and roll your data.
```

```
library(rpart.plot)
library(RColorBrewer)
library(VIM)
```

```
## Carregando pacotes exigidos: colorspace
## Carregando pacotes exigidos: grid
## VIM is ready to use.
##
## Suggestions and bug-reports can be submitted at: https://github.com/statistikat/VIM/issues
##
## Attaching package: 'VIM'
##
## The following object is masked from 'package:rattle':
##
##     wine
##
## The following object is masked from 'package:datasets':
##
##     sleep
```

Paralelização

```
c1 <- makePSOCKcluster(8)
registerDoParallel(c1)
#stopCluster(c1)
#registerDoSEQ()
#remove(c1)
```

Visualização Geral do DataFrame

```
options(scipen = 999) #visualização dos dados sem a notação científica

abalone <- read_csv("abalone.csv", show_col_types = FALSE)
abalone <- as_tibble(abalone)
abalone
```

```
## # A tibble: 4,177 x 9
##    Sex   Length Diameter Height `Whole weight` `Shucked weight` `Viscera weight`
##    <chr>  <dbl>    <dbl>  <dbl>          <dbl>            <dbl>            <dbl>
##  1 M      0.455    0.365  0.095          0.514           0.224            0.101
##  2 M      0.35     0.265  0.09           0.226           0.0995           0.0485
##  3 F      0.53     0.42   0.135          0.677           0.256            0.142
##  4 M      0.44     0.365  0.125          0.516           0.216            0.114
##  5 I      0.33     0.255  0.08           0.205           0.0895           0.0395
##  6 I      0.425    0.3    0.095          0.352           0.141            0.0775
##  7 F      0.53     0.415  0.15           0.778           0.237            0.142
##  8 F      0.545    0.425  0.125          0.768           0.294            0.150
##  9 M      0.475    0.37   0.125          0.509           0.216            0.112
## 10 F      0.55     0.44   0.15           0.894           0.314            0.151
## # i 4,167 more rows
## # i 2 more variables: `Shell weight` <dbl>, Rings <dbl>
```

O dataset possui 9 atributos e 4177 instâncias

```
#Atributos
ncol(abalone)
```

```
## [1] 9
```

```r
#Instâncias
nrow(abalone)
```

```
## [1] 4177
```

Dos 9 atributos, 8 são do tipo num e 1 do tipo chr.

```r
str(abalone)
```

```
## tibble [4,177 x 9] (S3: tbl_df/tbl/data.frame)
##  $ Sex           : chr [1:4177] "M" "M" "F" "M" ...
##  $ Length        : num [1:4177] 0.455 0.35 0.53 0.44 0.33 0.425 0.53 0.545 0.475 0.55 ...
##  $ Diameter      : num [1:4177] 0.365 0.265 0.42 0.365 0.255 0.3 0.415 0.425 0.37 0.44 ...
##  $ Height        : num [1:4177] 0.095 0.09 0.135 0.125 0.08 0.095 0.15 0.125 0.125 0.15 ...
##  $ Whole weight  : num [1:4177] 0.514 0.226 0.677 0.516 0.205 ...
##  $ Shucked weight: num [1:4177] 0.2245 0.0995 0.2565 0.2155 0.0895 ...
##  $ Viscera weight: num [1:4177] 0.101 0.0485 0.1415 0.114 0.0395 ...
##  $ Shell weight  : num [1:4177] 0.15 0.07 0.21 0.155 0.055 0.12 0.33 0.26 0.165 0.32 ...
##  $ Rings         : num [1:4177] 15 7 9 10 7 8 20 16 9 19 ...
```

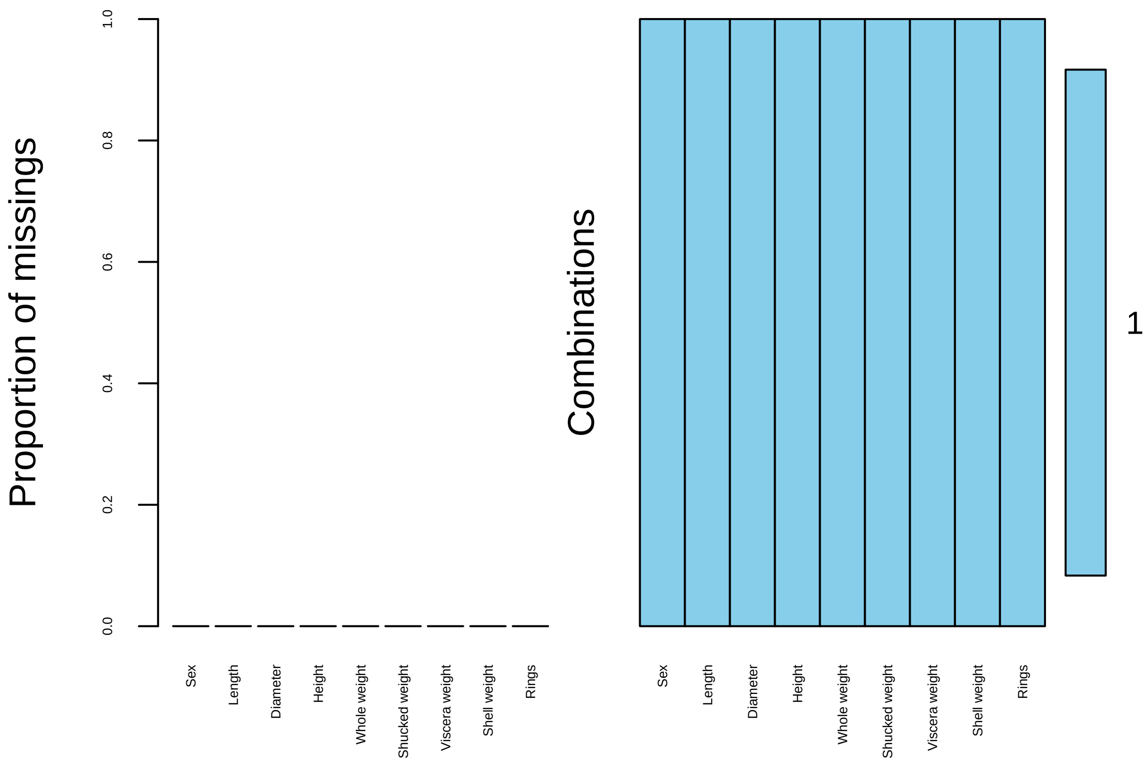
Aqui estão presentes o máximo, mínimo, média e mediana dos atributos númericos.*

```r
summary(abalone)
```

```
##      Sex                Length         Diameter          Height      
##  Length:4177        Min.   :0.075   Min.   :0.0550   Min.   :0.0000  
##  Class :character   1st Qu.:0.450   1st Qu.:0.3500   1st Qu.:0.1150  
##  Mode  :character   Median :0.545   Median :0.4250   Median :0.1400  
##                     Mean   :0.524   Mean   :0.4079   Mean   :0.1395  
##                     3rd Qu.:0.615   3rd Qu.:0.4800   3rd Qu.:0.1650  
##                     Max.   :0.815   Max.   :0.6500   Max.   :1.1300  
##   Whole weight    Shucked weight   Viscera weight    Shell weight   
##  Min.   :0.0020   Min.   :0.0010   Min.   :0.0005   Min.   :0.0015  
##  1st Qu.:0.4415   1st Qu.:0.1860   1st Qu.:0.0935   1st Qu.:0.1300  
##  Median :0.7995   Median :0.3360   Median :0.1710   Median :0.2340  
##  Mean   :0.8287   Mean   :0.3594   Mean   :0.1806   Mean   :0.2388  
##  3rd Qu.:1.1530   3rd Qu.:0.5020   3rd Qu.:0.2530   3rd Qu.:0.3290  
##  Max.   :2.8255   Max.   :1.4880   Max.   :0.7600   Max.   :1.0050  
##      Rings       
##  Min.   : 1.000  
##  1st Qu.: 8.000  
##  Median : 9.000  
##  Mean   : 9.934  
##  3rd Qu.:11.000  
##  Max.   :29.000
```

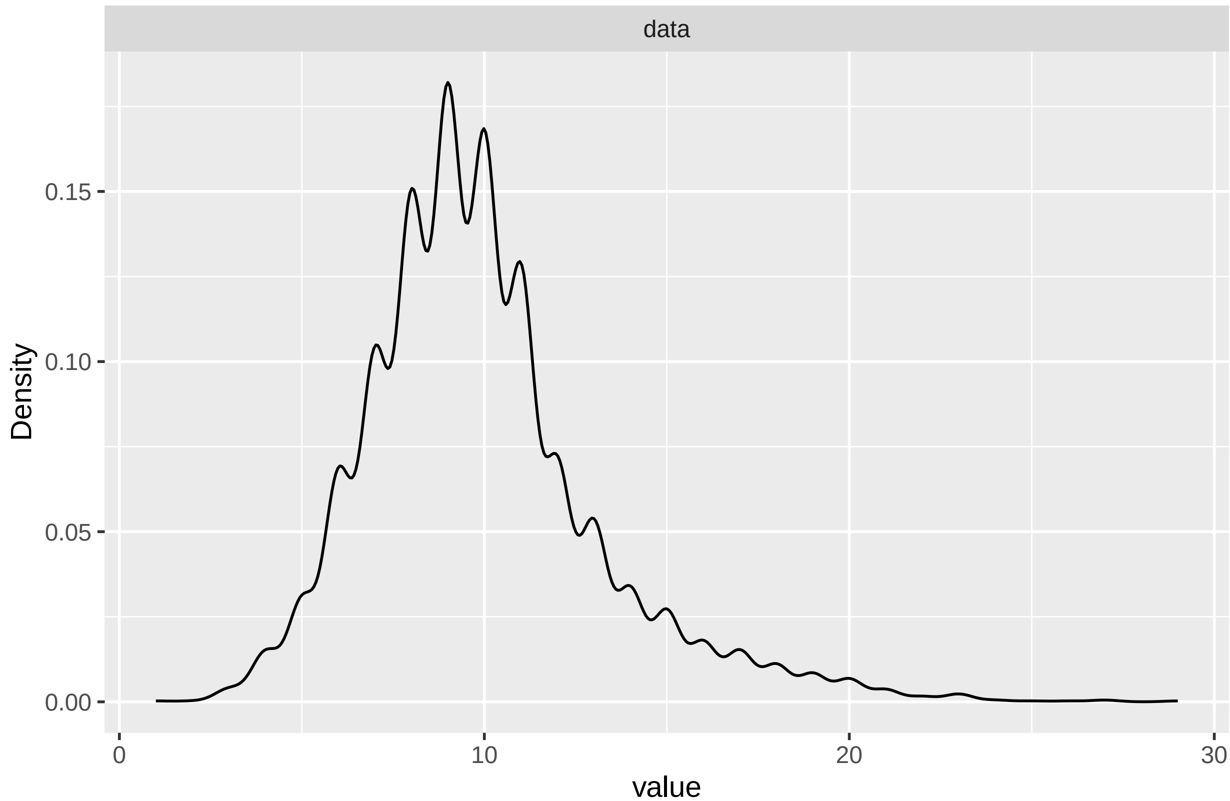
Verificação de dados Missing

```
ppData <- abalone
missPlotData <- aggr(ppData, numbers = TRUE, sortvars = TRUE, labels = names(ppData), cex.axis = 0.4, ga
```



Categorização da variável Rings em Old, Adult e Young

```
plot_density(abalone$Rings)
```




```
abalone_class <- abalone %>%
  mutate(Age=case_when(
    Rings %in% 1:5 ~ "young",
    Rings %in% 6:13 ~ "adult",
    Rings %in% 14:30 ~ "old"
  ))

#converte AGE em factor
abalone_class$Age <- as.factor(abalone_class$Age)
str(abalone_class)
```

```
## tibble [4,177 x 10] (S3: tbl_df/tbl/data.frame)
##  $ Sex           : chr [1:4177] "M" "M" "F" "M" ...
##  $ Length        : num [1:4177] 0.455 0.35 0.53 0.44 0.33 0.425 0.53 0.545 0.475 0.55 ...
##  $ Diameter      : num [1:4177] 0.365 0.265 0.42 0.365 0.255 0.3 0.415 0.425 0.37 0.44 ...
##  $ Height        : num [1:4177] 0.095 0.09 0.135 0.125 0.08 0.095 0.15 0.125 0.125 0.15 ...
##  $ Whole weight  : num [1:4177] 0.514 0.226 0.677 0.516 0.205 ...
##  $ Shucked weight: num [1:4177] 0.2245 0.0995 0.2565 0.2155 0.0895 ...
##  $ Viscera weight: num [1:4177] 0.101 0.0485 0.1415 0.114 0.0395 ...
##  $ Shell weight  : num [1:4177] 0.15 0.07 0.21 0.155 0.055 0.12 0.33 0.26 0.165 0.32 ...
##  $ Rings         : num [1:4177] 15 7 9 10 7 8 20 16 9 19 ...
##  $ Age           : Factor w/ 3 levels "adult","old",..: 2 1 1 1 1 1 2 2 1 2 ...
```

Retirada da coluna Rings

```r
myvars <- names(abalone_class) %in% c("Rings")
abalone_class <- abalone_class[!myvars]
str(abalone_class)
```

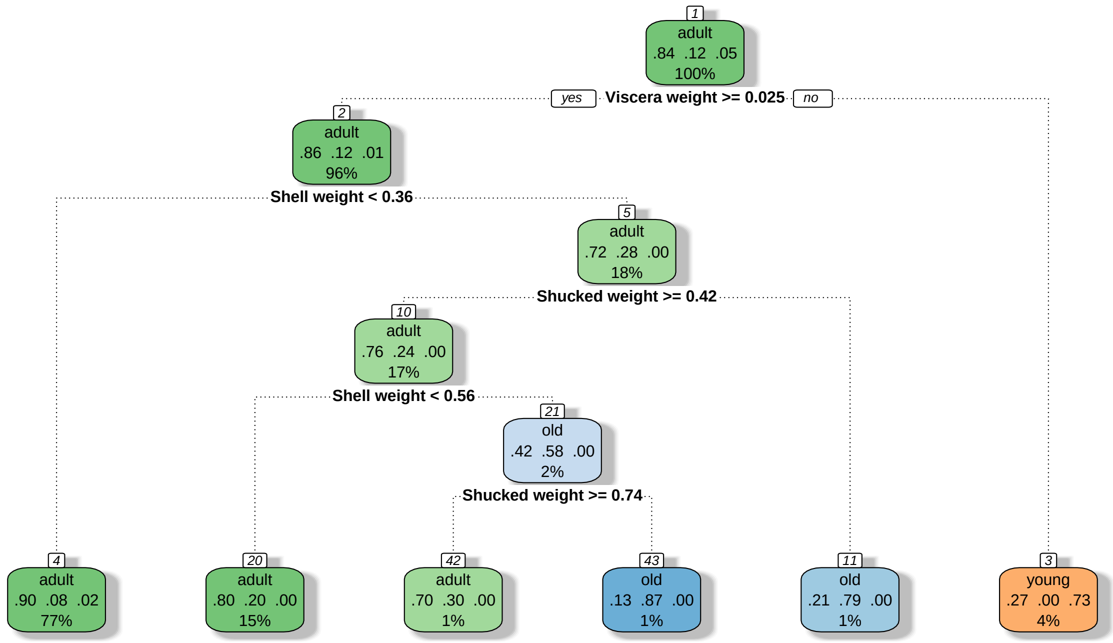
```
## tibble [4,177 x 9] (S3: tbl_df/tbl/data.frame)
##  $ Sex           : chr [1:4177] "M" "M" "F" "M" ...
##  $ Length        : num [1:4177] 0.455 0.35 0.53 0.44 0.33 0.425 0.53 0.545 0.475 0.55 ...
##  $ Diameter      : num [1:4177] 0.365 0.265 0.42 0.365 0.255 0.3 0.415 0.425 0.37 0.44 ...
##  $ Height        : num [1:4177] 0.095 0.09 0.135 0.125 0.08 0.095 0.15 0.125 0.125 0.15 ...
##  $ Whole weight  : num [1:4177] 0.514 0.226 0.677 0.516 0.205 ...
##  $ Shucked weight: num [1:4177] 0.2245 0.0995 0.2565 0.2155 0.0895 ...
##  $ Viscera weight: num [1:4177] 0.101 0.0485 0.1415 0.114 0.0395 ...
##  $ Shell weight  : num [1:4177] 0.15 0.07 0.21 0.155 0.055 0.12 0.33 0.26 0.165 0.32 ...
##  $ Age           : Factor w/ 3 levels "adult","old",..: 2 1 1 1 1 1 2 2 1 2 ...
```

Separação entre treino e teste

```r
set.seed(123)
partition <- createDataPartition(abalone_class$Age, p=0.75, list = FALSE)

train.set <- abalone_class[partition,]
test.set <- abalone_class[-partition,]

#test.set
```

Modelo e plot da Árvore

```r
abalone_tree <- rpart(Age~., data=train.set, method = "class", control=rpart.control(minsplit=60, minbu

fancyRpartPlot(abalone_tree, caption = NULL)
```



Predições

```
predictions <- predict(abalone_tree,test.set)

predictions
```

```
##          adult        old      young
## 1    0.8983051 0.08474576 0.01694915
## 2    0.8983051 0.08474576 0.01694915
## 3    0.8983051 0.08474576 0.01694915
## 4    0.8983051 0.08474576 0.01694915
## 5    0.8983051 0.08474576 0.01694915
## 6    0.8983051 0.08474576 0.01694915
## 7    0.2681159 0.00000000 0.73188406
## 8    0.8983051 0.08474576 0.01694915
## 9    0.8983051 0.08474576 0.01694915
## 10   0.2093023 0.79069767 0.00000000
## 11   0.8983051 0.08474576 0.01694915
## 12   0.8983051 0.08474576 0.01694915
## 13   0.8016878 0.19831224 0.00000000
## 14   0.8983051 0.08474576 0.01694915
## 15   0.8983051 0.08474576 0.01694915
## 16   0.2093023 0.79069767 0.00000000
## 17   0.8016878 0.19831224 0.00000000
## 18   0.8983051 0.08474576 0.01694915
## 19   0.8983051 0.08474576 0.01694915
```

```
## 20   0.8983051 0.08474576 0.01694915
## 21   0.8983051 0.08474576 0.01694915
## 22   0.8983051 0.08474576 0.01694915
## 23   0.8983051 0.08474576 0.01694915
## 24   0.8983051 0.08474576 0.01694915
## 25   0.8983051 0.08474576 0.01694915
## 26   0.8983051 0.08474576 0.01694915
## 27   0.2681159 0.00000000 0.73188406
## 28   0.8016878 0.19831224 0.00000000
## 29   0.7000000 0.30000000 0.00000000
## 30   0.8983051 0.08474576 0.01694915
## 31   0.8983051 0.08474576 0.01694915
## 32   0.8983051 0.08474576 0.01694915
## 33   0.8983051 0.08474576 0.01694915
## 34   0.8016878 0.19831224 0.00000000
## 35   0.8983051 0.08474576 0.01694915
## 36   0.8983051 0.08474576 0.01694915
## 37   0.8983051 0.08474576 0.01694915
## 38   0.8983051 0.08474576 0.01694915
## 39   0.2681159 0.00000000 0.73188406
## 40   0.8983051 0.08474576 0.01694915
## 41   0.8983051 0.08474576 0.01694915
## 42   0.2093023 0.79069767 0.00000000
## 43   0.8983051 0.08474576 0.01694915
## 44   0.1333333 0.86666667 0.00000000
## 45   0.7000000 0.30000000 0.00000000
## 46   0.1333333 0.86666667 0.00000000
## 47   0.8983051 0.08474576 0.01694915
## 48   0.8983051 0.08474576 0.01694915
## 49   0.8983051 0.08474576 0.01694915
## 50   0.2681159 0.00000000 0.73188406
## 51   0.8983051 0.08474576 0.01694915
## 52   0.2093023 0.79069767 0.00000000
## 53   0.8983051 0.08474576 0.01694915
## 54   0.8983051 0.08474576 0.01694915
## 55   0.8983051 0.08474576 0.01694915
## 56   0.8983051 0.08474576 0.01694915
## 57   0.8983051 0.08474576 0.01694915
## 58   0.8983051 0.08474576 0.01694915
## 59   0.8983051 0.08474576 0.01694915
## 60   0.8983051 0.08474576 0.01694915
## 61   0.8983051 0.08474576 0.01694915
## 62   0.8983051 0.08474576 0.01694915
## 63   0.8016878 0.19831224 0.00000000
## 64   0.2681159 0.00000000 0.73188406
## 65   0.8983051 0.08474576 0.01694915
## 66   0.8983051 0.08474576 0.01694915
## 67   0.8016878 0.19831224 0.00000000
## 68   0.8983051 0.08474576 0.01694915
## 69   0.8983051 0.08474576 0.01694915
## 70   0.8016878 0.19831224 0.00000000
## 71   0.8016878 0.19831224 0.00000000
## 72   0.8983051 0.08474576 0.01694915
## 73   0.8983051 0.08474576 0.01694915
```

```
## 74   0.8983051 0.08474576 0.01694915
## 75   0.8983051 0.08474576 0.01694915
## 76   0.8983051 0.08474576 0.01694915
## 77   0.8983051 0.08474576 0.01694915
## 78   0.8016878 0.19831224 0.00000000
## 79   0.8983051 0.08474576 0.01694915
## 80   0.8016878 0.19831224 0.00000000
## 81   0.2093023 0.79069767 0.00000000
## 82   0.8016878 0.19831224 0.00000000
## 83   0.8016878 0.19831224 0.00000000
## 84   0.8983051 0.08474576 0.01694915
## 85   0.2681159 0.00000000 0.73188406
## 86   0.2681159 0.00000000 0.73188406
## 87   0.8983051 0.08474576 0.01694915
## 88   0.8983051 0.08474576 0.01694915
## 89   0.8983051 0.08474576 0.01694915
## 90   0.8983051 0.08474576 0.01694915
## 91   0.8983051 0.08474576 0.01694915
## 92   0.8983051 0.08474576 0.01694915
## 93   0.8983051 0.08474576 0.01694915
## 94   0.8983051 0.08474576 0.01694915
## 95   0.8983051 0.08474576 0.01694915
## 96   0.8016878 0.19831224 0.00000000
## 97   0.8983051 0.08474576 0.01694915
## 98   0.8983051 0.08474576 0.01694915
## 99   0.8016878 0.19831224 0.00000000
## 100  0.1333333 0.86666667 0.00000000
## 101  0.1333333 0.86666667 0.00000000
## 102  0.8983051 0.08474576 0.01694915
## 103  0.8983051 0.08474576 0.01694915
## 104  0.8983051 0.08474576 0.01694915
## 105  0.8983051 0.08474576 0.01694915
## 106  0.8983051 0.08474576 0.01694915
## 107  0.8983051 0.08474576 0.01694915
## 108  0.8983051 0.08474576 0.01694915
## 109  0.8983051 0.08474576 0.01694915
## 110  0.2093023 0.79069767 0.00000000
## 111  0.8983051 0.08474576 0.01694915
## 112  0.2093023 0.79069767 0.00000000
## 113  0.8983051 0.08474576 0.01694915
## 114  0.8983051 0.08474576 0.01694915
## 115  0.8983051 0.08474576 0.01694915
## 116  0.8983051 0.08474576 0.01694915
## 117  0.8983051 0.08474576 0.01694915
## 118  0.2093023 0.79069767 0.00000000
## 119  0.2093023 0.79069767 0.00000000
## 120  0.8983051 0.08474576 0.01694915
## 121  0.8983051 0.08474576 0.01694915
## 122  0.8983051 0.08474576 0.01694915
## 123  0.8983051 0.08474576 0.01694915
## 124  0.2681159 0.00000000 0.73188406
## 125  0.8016878 0.19831224 0.00000000
## 126  0.8016878 0.19831224 0.00000000
## 127  0.8983051 0.08474576 0.01694915
```

```
## 128  0.8983051 0.08474576 0.01694915
## 129  0.8016878 0.19831224 0.00000000
## 130  0.8983051 0.08474576 0.01694915
## 131  0.8016878 0.19831224 0.00000000
## 132  0.8983051 0.08474576 0.01694915
## 133  0.8983051 0.08474576 0.01694915
## 134  0.8983051 0.08474576 0.01694915
## 135  0.2681159 0.00000000 0.73188406
## 136  0.8983051 0.08474576 0.01694915
## 137  0.2681159 0.00000000 0.73188406
## 138  0.8983051 0.08474576 0.01694915
## 139  0.2681159 0.00000000 0.73188406
## 140  0.8983051 0.08474576 0.01694915
## 141  0.8983051 0.08474576 0.01694915
## 142  0.8983051 0.08474576 0.01694915
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## 148  0.8983051 0.08474576 0.01694915
## 149  0.8983051 0.08474576 0.01694915
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## 151  0.8983051 0.08474576 0.01694915
## 152  0.8983051 0.08474576 0.01694915
## 153  0.8983051 0.08474576 0.01694915
## 154  0.8983051 0.08474576 0.01694915
## 155  0.8983051 0.08474576 0.01694915
## 156  0.8983051 0.08474576 0.01694915
## 157  0.2681159 0.00000000 0.73188406
## 158  0.8983051 0.08474576 0.01694915
## 159  0.8983051 0.08474576 0.01694915
## 160  0.2681159 0.00000000 0.73188406
## 161  0.8983051 0.08474576 0.01694915
## 162  0.8983051 0.08474576 0.01694915
## 163  0.8983051 0.08474576 0.01694915
## 164  0.8983051 0.08474576 0.01694915
## 165  0.8983051 0.08474576 0.01694915
## 166  0.8983051 0.08474576 0.01694915
## 167  0.8983051 0.08474576 0.01694915
## 168  0.8983051 0.08474576 0.01694915
## 169  0.8983051 0.08474576 0.01694915
## 170  0.2681159 0.00000000 0.73188406
## 171  0.8983051 0.08474576 0.01694915
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## 558  0.2093023 0.79069767 0.00000000
## 559  0.8016878 0.19831224 0.00000000
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## 927  0.8016878 0.19831224 0.00000000
## 928  0.7000000 0.30000000 0.00000000
## 929  0.8983051 0.08474576 0.01694915
## 930  0.8983051 0.08474576 0.01694915
## 931  0.8983051 0.08474576 0.01694915
## 932  0.8983051 0.08474576 0.01694915
## 933  0.8983051 0.08474576 0.01694915
## 934  0.8983051 0.08474576 0.01694915
## 935  0.8983051 0.08474576 0.01694915
## 936  0.8983051 0.08474576 0.01694915
## 937  0.8016878 0.19831224 0.00000000
```

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## 938  0.8983051 0.08474576 0.01694915
## 939  0.8983051 0.08474576 0.01694915
## 940  0.8983051 0.08474576 0.01694915
## 941  0.8983051 0.08474576 0.01694915
## 942  0.8983051 0.08474576 0.01694915
## 943  0.8983051 0.08474576 0.01694915
## 944  0.8983051 0.08474576 0.01694915
## 945  0.8983051 0.08474576 0.01694915
## 946  0.8983051 0.08474576 0.01694915
## 947  0.8016878 0.19831224 0.00000000
## 948  0.8016878 0.19831224 0.00000000
## 949  0.8016878 0.19831224 0.00000000
## 950  0.8016878 0.19831224 0.00000000
## 951  0.8016878 0.19831224 0.00000000
## 952  0.8983051 0.08474576 0.01694915
## 953  0.8983051 0.08474576 0.01694915
## 954  0.8983051 0.08474576 0.01694915
## 955  0.8983051 0.08474576 0.01694915
## 956  0.8983051 0.08474576 0.01694915
## 957  0.8983051 0.08474576 0.01694915
## 958  0.8983051 0.08474576 0.01694915
## 959  0.8983051 0.08474576 0.01694915
## 960  0.8983051 0.08474576 0.01694915
## 961  0.8983051 0.08474576 0.01694915
## 962  0.8983051 0.08474576 0.01694915
## 963  0.8983051 0.08474576 0.01694915
## 964  0.8983051 0.08474576 0.01694915
## 965  0.8016878 0.19831224 0.00000000
## 966  0.8983051 0.08474576 0.01694915
## 967  0.8983051 0.08474576 0.01694915
## 968  0.8983051 0.08474576 0.01694915
## 969  0.8983051 0.08474576 0.01694915
## 970  0.8983051 0.08474576 0.01694915
## 971  0.8983051 0.08474576 0.01694915
## 972  0.8983051 0.08474576 0.01694915
## 973  0.8983051 0.08474576 0.01694915
## 974  0.2093023 0.79069767 0.00000000
## 975  0.8983051 0.08474576 0.01694915
## 976  0.8983051 0.08474576 0.01694915
## 977  0.8983051 0.08474576 0.01694915
## 978  0.8983051 0.08474576 0.01694915
## 979  0.8983051 0.08474576 0.01694915
## 980  0.8983051 0.08474576 0.01694915
## 981  0.8983051 0.08474576 0.01694915
## 982  0.8983051 0.08474576 0.01694915
## 983  0.8016878 0.19831224 0.00000000
## 984  0.8016878 0.19831224 0.00000000
## 985  0.2681159 0.00000000 0.73188406
## 986  0.8983051 0.08474576 0.01694915
## 987  0.8983051 0.08474576 0.01694915
## 988  0.8983051 0.08474576 0.01694915
## 989  0.8983051 0.08474576 0.01694915
## 990  0.8983051 0.08474576 0.01694915
## 991  0.8983051 0.08474576 0.01694915
```

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## 992  0.8983051 0.08474576 0.01694915
## 993  0.8983051 0.08474576 0.01694915
## 994  0.8983051 0.08474576 0.01694915
## 995  0.8983051 0.08474576 0.01694915
## 996  0.8983051 0.08474576 0.01694915
## 997  0.8983051 0.08474576 0.01694915
## 998  0.8016878 0.19831224 0.00000000
## 999  0.8016878 0.19831224 0.00000000
## 1000 0.2681159 0.00000000 0.73188406
## 1001 0.8983051 0.08474576 0.01694915
## 1002 0.8983051 0.08474576 0.01694915
## 1003 0.8983051 0.08474576 0.01694915
## 1004 0.8983051 0.08474576 0.01694915
## 1005 0.8983051 0.08474576 0.01694915
## 1006 0.8983051 0.08474576 0.01694915
## 1007 0.8983051 0.08474576 0.01694915
## 1008 0.8983051 0.08474576 0.01694915
## 1009 0.8983051 0.08474576 0.01694915
## 1010 0.8983051 0.08474576 0.01694915
## 1011 0.8016878 0.19831224 0.00000000
## 1012 0.8983051 0.08474576 0.01694915
## 1013 0.8983051 0.08474576 0.01694915
## 1014 0.8983051 0.08474576 0.01694915
## 1015 0.8983051 0.08474576 0.01694915
## 1016 0.8983051 0.08474576 0.01694915
## 1017 0.8983051 0.08474576 0.01694915
## 1018 0.8983051 0.08474576 0.01694915
## 1019 0.8983051 0.08474576 0.01694915
## 1020 0.8983051 0.08474576 0.01694915
## 1021 0.8983051 0.08474576 0.01694915
## 1022 0.8983051 0.08474576 0.01694915
## 1023 0.8016878 0.19831224 0.00000000
## 1024 0.8016878 0.19831224 0.00000000
## 1025 0.8016878 0.19831224 0.00000000
## 1026 0.8016878 0.19831224 0.00000000
## 1027 0.8983051 0.08474576 0.01694915
## 1028 0.8983051 0.08474576 0.01694915
## 1029 0.8983051 0.08474576 0.01694915
## 1030 0.8983051 0.08474576 0.01694915
## 1031 0.8983051 0.08474576 0.01694915
## 1032 0.8983051 0.08474576 0.01694915
## 1033 0.8983051 0.08474576 0.01694915
## 1034 0.8983051 0.08474576 0.01694915
## 1035 0.8983051 0.08474576 0.01694915
## 1036 0.8016878 0.19831224 0.00000000
## 1037 0.8016878 0.19831224 0.00000000
## 1038 0.8983051 0.08474576 0.01694915
## 1039 0.8983051 0.08474576 0.01694915
## 1040 0.8983051 0.08474576 0.01694915
## 1041 0.8983051 0.08474576 0.01694915
## 1042 0.8983051 0.08474576 0.01694915
## 1043 0.8983051 0.08474576 0.01694915
```

**Como a estrutura de predictions está dessa forma adult old young 1 0.8983051 0.08474576 0.01694915

Eu fiz uma função para colocar em uma lista o nome da coluna com o maior valor. E após uso a função factor para que fique igual a test.set$Age o que me permite usar a confusionMatrix**

```
maior_coluna <- function(dados) {
  idx <- max.col(dados)
  nomes <- colnames(dados)
  resultado <- lapply(1:nrow(dados), function(i) nomes[idx[i]])
  return(resultado)
}

predicao <- maior_coluna(data.frame(predictions))

predicao_class <- factor(make.names(predicao))

#str(predicao_class)
#str(test.set$Age)
```

Matriz de Confusão

```
cm <- confusionMatrix(predicao_class, test.set$Age, mode = "everything")
cm
```

```
## Confusion Matrix and Statistics
##
##             Reference
## Prediction adult old young
##      adult   853 106    13
##      old       9  16     0
##      young    12   0    34
##
## Overall Statistics
##
##                Accuracy : 0.8658
##                  95% CI : (0.8436, 0.8859)
##     No Information Rate : 0.838
##     P-Value [Acc > NIR] : 0.007265
##
##                   Kappa : 0.3736
##
##  Mcnemar's Test P-Value : NA
##
## Statistics by Class:
##
##                      Class: adult Class: old Class: young
## Sensitivity                0.9760    0.13115      0.72340
## Specificity                0.2959    0.99023      0.98795
## Pos Pred Value             0.8776    0.64000      0.73913
## Neg Pred Value             0.7042    0.89587      0.98696
## Precision                  0.8776    0.64000      0.73913
## Recall                     0.9760    0.13115      0.72340
## F1                         0.9242    0.21769      0.73118
## Prevalence                 0.8380    0.11697      0.04506
```

```
## Detection Rate              0.8178    0.01534      0.03260
## Detection Prevalence        0.9319    0.02397      0.04410
## Balanced Accuracy           0.6359    0.56069      0.85568
```

```r
#str(train.set$Age)
#str(predicao_class)

#cm <- confusionMatrix(predicao_class, train.set$Age, mode = "everything")
#cm
```