Prediciendo la Edad de los Abalones mediante Modelos Lineales

1 Scope

The scope of this R-markdown notebook consists on predicting the age of abalones by means of machine learning linear regression models. In doing this, we use modern R syntax and libraries from tidyverse ecosystem such as dplyR, ggplot and readr

```
require(readr)
abalone <- readr::read_csv("datos/abalone.txt", col_names=F)
# Angel Muelas et al
# Data file does not contain descriptor names
nombres_col <- c(
  "Sex",
  "Length",
  "Diameter",
  "Height",
  "Who_weight",
  "Shu_weight",
  "Viscera",
  "Shell",
  "Rings"
)
# Redefining tibble_df object
colnames(abalone) <- nombres_col
abalone$Sex <- as.factor(abalone$Sex)
```

2 EDA

Looking for null-values

```
summary(abalone)
```

```
##  Sex          Length         Diameter          Height         Who_weight
##  F:1307   Min.   :0.075   Min.   :0.0550   Min.   :0.0000   Min.   :0.0020
##  I:1342   1st Qu.:0.450   1st Qu.:0.3500   1st Qu.:0.1150   1st Qu.:0.4415
##  M:1528   Median :0.545   Median :0.4250   Median :0.1400   Median :0.7995
##           Mean   :0.524   Mean   :0.4079   Mean   :0.1395   Mean   :0.8287
##           3rd Qu.:0.615   3rd Qu.:0.4800   3rd Qu.:0.1650   3rd Qu.:1.1530
##           Max.   :0.815   Max.   :0.6500   Max.   :1.1300   Max.   :2.8255
##    Shu_weight        Viscera           Shell            Rings
##  Min.   :0.0010   Min.   :0.0005   Min.   :0.0015   Min.   : 1.000
##  1st Qu.:0.1860   1st Qu.:0.0935   1st Qu.:0.1300   1st Qu.: 8.000
##  Median :0.3360   Median :0.1710   Median :0.2340   Median : 9.000
##  Mean   :0.3594   Mean   :0.1806   Mean   :0.2388   Mean   : 9.934
##  3rd Qu.:0.5020   3rd Qu.:0.2530   3rd Qu.:0.3290   3rd Qu.:11.000
##  Max.   :1.4880   Max.   :0.7600   Max.   :1.0050   Max.   :29.000
```

There are not null-values, however some nonsensical zero-values are present for the feature Height. Let us

localize them

1. Classic syntax

```
# more familiar for pandas python users
abalone[abalone$Height==0,]
```

```
## # A tibble: 2 x 9
##   Sex   Length Diameter Height Who_weight Shu_weight Viscera Shell Rings
##   <fct>  <dbl>    <dbl>  <dbl>      <dbl>      <dbl>   <dbl> <dbl> <dbl>
## 1 I      0.43      0.34      0      0.428     0.206   0.086  0.115     8
## 2 I      0.315     0.23      0      0.134     0.0575  0.0285 0.350     6
```

2. Modern syntax (`dplyr`)

```
require(dplyr)
dplyr::filter(abalone, Height==0)
```

```
## # A tibble: 2 x 9
##   Sex   Length Diameter Height Who_weight Shu_weight Viscera Shell Rings
##   <fct>  <dbl>    <dbl>  <dbl>      <dbl>      <dbl>   <dbl> <dbl> <dbl>
## 1 I      0.43      0.34      0      0.428     0.206   0.086  0.115     8
## 2 I      0.315     0.23      0      0.134     0.0575  0.0285 0.350     6
```

Therefore, in order to filter null `Height` values we can proceed as follows

```
abalone <- dplyr::filter(abalone, Height!=0)
```

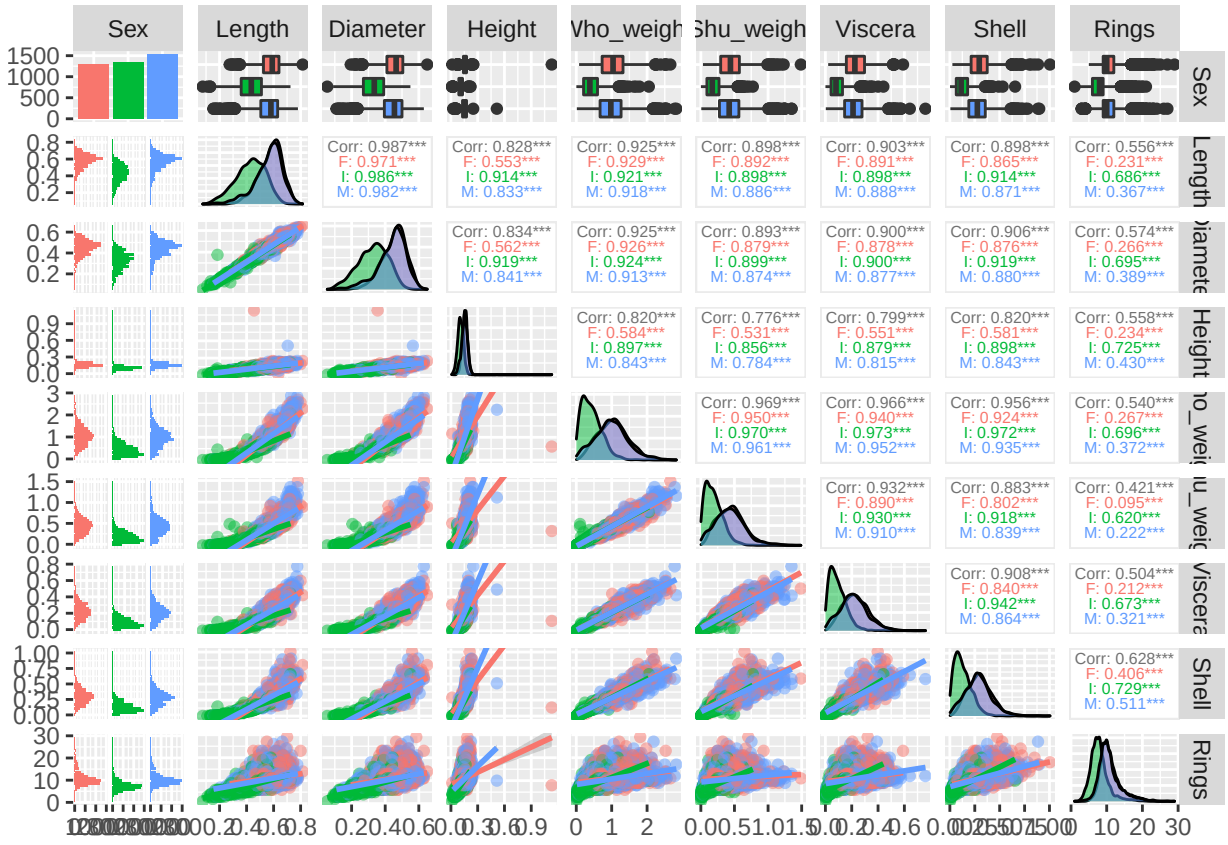
2.1 Descriptive Analysis

```
# Equivalent to .describe()
summary(abalone)
```

```
##  Sex          Length          Diameter          Height         Who_weight
##  F:1307   Min.   :0.0750   Min.   :0.0550   Min.   :0.0100   Min.   :0.0020
##  I:1340   1st Qu.:0.4500   1st Qu.:0.3500   1st Qu.:0.1150   1st Qu.:0.4422
##  M:1528   Median :0.5450   Median :0.4250   Median :0.1400   Median :0.8000
##           Mean   :0.5241   Mean   :0.4079   Mean   :0.1396   Mean   :0.8290
##           3rd Qu.:0.6150   3rd Qu.:0.4800   3rd Qu.:0.1650   3rd Qu.:1.1535
##           Max.   :0.8150   Max.   :0.6500   Max.   :1.1300   Max.   :2.8255
##    Shu_weight        Viscera           Shell            Rings
##  Min.   :0.0010   Min.   :0.0005   Min.   :0.0015   Min.   : 1.000
##  1st Qu.:0.1862   1st Qu.:0.0935   1st Qu.:0.1300   1st Qu.: 8.000
##  Median :0.3360   Median :0.1710   Median :0.2340   Median : 9.000
##  Mean   :0.3595   Mean   :0.1807   Mean   :0.2388   Mean   : 9.935
##  3rd Qu.:0.5020   3rd Qu.:0.2530   3rd Qu.:0.3287   3rd Qu.:11.000
##  Max.   :1.4880   Max.   :0.7600   Max.   :1.0050   Max.   :29.000
```

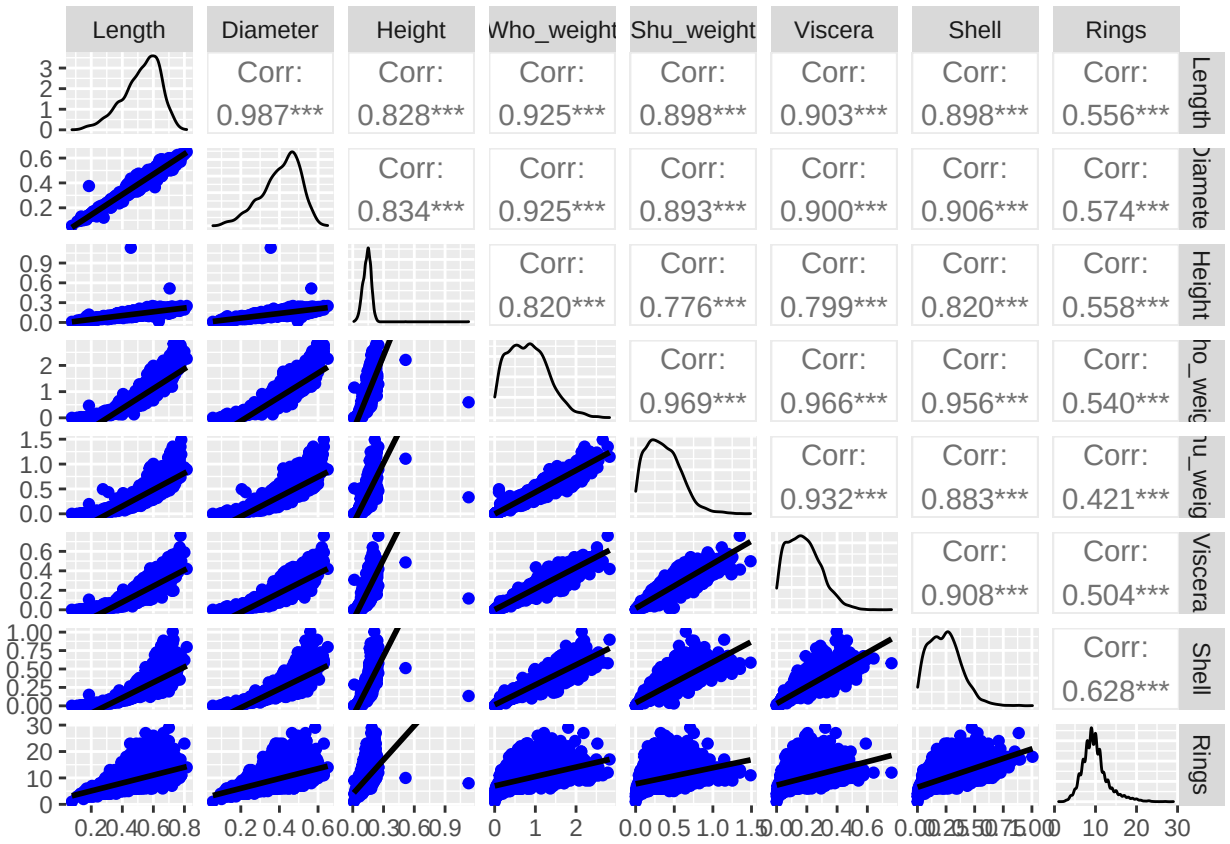
```
# Qualitative cross-relations within ggpairs()
# including categorical variable: Sex
require(GGally)
ggpairs(
  data = abalone,
  mapping = ggplot2::aes(colour=Sex),
  diag = list(
    discrete="barDiag",                          # Facet BoxPlot
    continuous=wrap("densityDiag", alpha=0.5)    # density for numerical
```

```
  ),
  upper = list(continuous=wrap("cor", size=2)), # correlations on upper-diagonal
  lower = list(
    continuous=wrap("smooth", alpha=0.5)#,
  ),
progress = F # suppress verbosity
)
```



Excluding `Sex` feature (facet) in the discussion we have

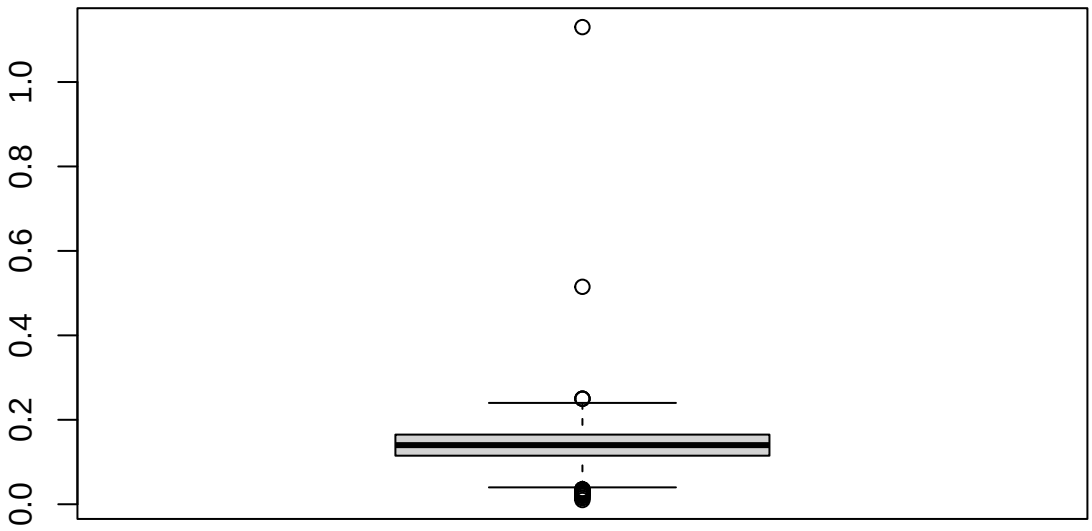
```
ggpairs(
  data = abalone %>% select(-Sex),
  upper = list(continuous=wrap("cor", size=4)),
  lower = list(continuous=wrap("smooth", colour="blue")),
  progress = F
)
```



2.2 Outliers Detection

From visual inspection, clearly `Height` feature exhibits two outliers. We can see it more precisely by using boxplot diagram restricted to this feature:

```
abalone %>% dplyr::select(Height) %>% boxplot()
```

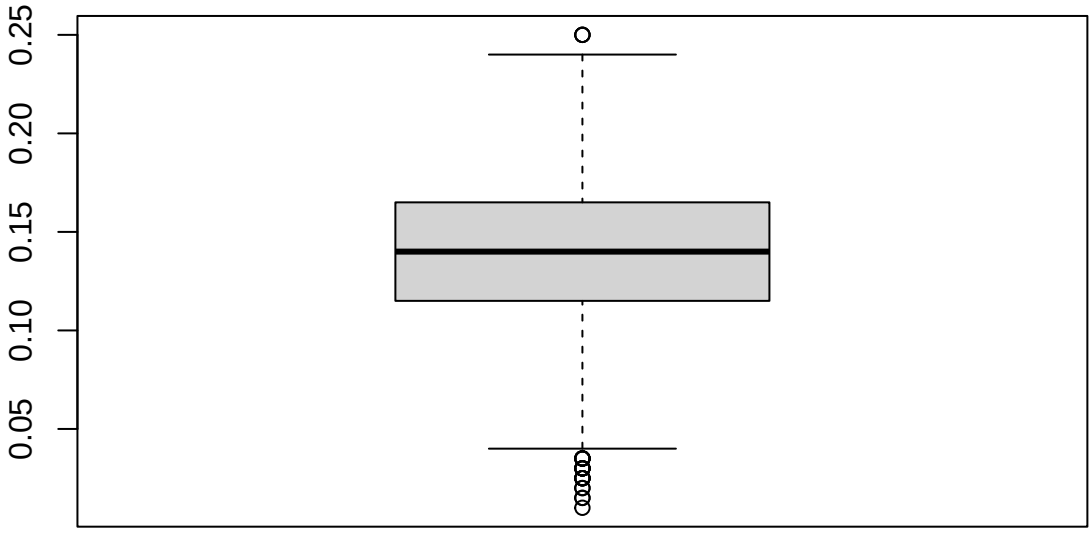


In order to drop them, we can use filter

```
abalone <-
  abalone %>% dplyr::filter(Height<0.5)
```

and test

```
abalone %>% select(Height) %>% boxplot()
```



Strong cross-correlations between features (all variables except # Rings) could be a sign of co linearity or multicolinearity (redundancy).