Projekt.Eksploracja danych. Zastosowanie przecinania drzew klasyfikacyjnych i selekcji atrybutów istotnych dla zwiększenia wydajności klasyfikatora drzew decyzijnych

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```r
library(caTools)
library(randomForest)
```

```
## randomForest 4.6-14
```

```
## Type rfNews() to see new features/changes/bug fixes.
```

```r
library(rpart.plot)
```

```
## Loading required package: rpart
```

```r
library(gbm)
```

```
## Warning: package 'gbm' was built under R version 3.6.2
```

```
## Loaded gbm 2.1.5
```

```r
library(rpart)
library(caret)
```

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

```
## Loading required package: ggplot2
```

```
##
## Attaching package: 'ggplot2'
```

```
## The following object is masked from 'package:randomForest':
##
##     margin
```

```r
library(ggplot2)
library(scales)
library(corrplot)
```

```
## corrplot 0.84 loaded
```

```r
library(RColorBrewer)
library(dplyr)
```

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

## The following object is masked from 'package:randomForest':
##
##     combine

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

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

```r
library(partykit)
```

```
## Warning: package 'partykit' was built under R version 3.6.2

## Loading required package: grid

## Loading required package: libcoin

## Warning: package 'libcoin' was built under R version 3.6.2

## Loading required package: mvtnorm
```

```r
#Warunek sprawdzenia deryktorii
g <- "C:/Users/Darya/Documents"
if (getwd()!= g )
setwd(g) ;
getwd()
```

```
## [1] "C:/Users/Darya/Documents"
```

```r
liczba_walidacji=30

#Wczytywanie zbiorów to listy , zaznaczonych w pliku xsl
lista_baz<-read.csv ( "bazki.csv" , sep=";")
ilosc_baz<-nrow(lista_baz)


#Tworzenie tabeli podsumowenia_wynikow
podsumowenia_wynikow<-matrix(nrow=ilosc_baz, ncol=5)
colnames(podsumowenia_wynikow)<-c("Dataset name ","Base accuracy","Preprune accuracy","Postprune accura
```

```r
#Tworzenie tabeli wyniki_badan , gdzie będą zaznaczonę błędy klasyfikacji przy każdej iteracji
wyniki_badan1<-matrix(data=NA, nrow=liczba_walidacji +1, ncol=ilosc_baz*2)
wyniki_badan2<-matrix(data=NA, nrow=liczba_walidacji +1, ncol=ilosc_baz*2)


#Pętła która wczyruję bazy z listy i generuje wstępnę analizę danych
for ( i in 1 :ilosc_baz )
{

nazwa_bazy<-lista_baz[i,2]

 print(paste("==========  Wstępna analiza danych bazy: ==========", nazwa_bazy))
  dataset<-read.csv(toString(nazwa_bazy))

  print(paste("==========  Summary: ==========", nazwa_bazy))
  print(summary(dataset));
  print('*********************************************************')
  print('*********************************************************')
  print('*********************************************************')
   print(paste("==========  Structure: ==========", nazwa_bazy))
  print(str(dataset))
   print('*********************************************************')
  print('*********************************************************')
  print('*********************************************************')
  print('*********************************************************')
  print(paste("==========  Attribute data type: ==========", nazwa_bazy))
  print(sapply(dataset,class))
   print('*********************************************************')
  print('*********************************************************')
  print('*********************************************************')
  print('*********************************************************')
  print(paste("==========  First samples: ==========", nazwa_bazy))
  print(head(dataset))
  print('*********************************************************')
  print('*********************************************************')
  print('*********************************************************')

  print(paste("==========  Last samples: ==========", nazwa_bazy))
  print(tail(dataset))
   print('*********************************************************')
  print('*********************************************************')
  print('*********************************************************')
  print('*********************************************************')
  print(paste("==========  Dataset Dimenssions: ==========", nazwa_bazy))
  print(dim(dataset))
  print(paste("==========  Histogram Plot of  Decision Classes: ==========", nazwa_bazy))

  #Zmienna zawierająca nazwę atrybutu decyzijnego
  decision_name<-tail(colnames(dataset),n=1)

  #Zmienna zawierająca  atrybut decyzijny
 decision_cln<- paste(dataset[,ncol(dataset)])
```

```r
  plot_<-ggplot(dataset, aes(x=decision_cln, fill= decision_cln)) + geom_bar(aes(y = (..count..)/sum(..
wykres1<-plot_+ labs(title = paste("wykres atrybutu decyzji", nazwa_bazy),x=decision_name)
  print(wykres1)

  print(paste("==========  Desity Plot of  Decision Classes: ==========", nazwa_bazy))
  wykres2<-ggplot(dataset, aes(x=dataset[,ncol(dataset)])) + geom_density(color="darkblue", fill="lightl
  print(wykres2)
 print(paste("==========  Correlation Plot of  Dataframe: ==========", nazwa_bazy))
  dataset.cor = cor(dataset)
  corrplot(dataset.cor)


#Analysing


wyniki_badan1[1,i*2-1]<-paste(nazwa_bazy,"Base accuracy")
wyniki_badan1[1,i*2]<-paste(nazwa_bazy,"Preprune accuracy")
wyniki_badan2[1,i*2-1]<-paste(nazwa_bazy,"Postprune accuracy")
wyniki_badan2[1,i*2]<-paste(nazwa_bazy,"Attribute selction")


podsumowenia_wynikow[i,1]<-ifelse(is.na(podsumowenia_wynikow[i,1]), as.character(nazwa_bazy), podsumowen
dataset<-read.csv(toString(nazwa_bazy))
decision_name<-tail(colnames(dataset),n=1)
cln_nmb<-which(colnames(dataset)==decision_name)


dataset[,-cln_nmb] = scale(dataset[,-cln_nmb])

waznosc.rf<-randomForest(dataset[,ncol(dataset)]~ ., data= dataset,importance=TRUE, ntree=1000)
imp_list<-waznosc.rf$importance
imp_list<-imp_list[-nrow(imp_list),2]

atrybuty_istotne<-names(which(imp_list>mean(imp_list)))

plot( waznosc.rf, main = paste( "Baza",nazwa_bazy))
varImpPlot(waznosc.rf, main = paste ( "Baza", nazwa_bazy))

#training_set = subset(dataset, split == TRUE)
#test_set = subset(dataset, split == FALSE)
for ( j in 1 : liczba_walidacji ){
 indexes <- sample(1:dim(dataset)[1],nrow(dataset))
dataset <- dataset[indexes,]
df=sort(sample(nrow(dataset),nrow(dataset)*.7))

training_set = dataset[df,]
test_set = dataset[-df,]

decision_name<-tail(colnames(dataset),n=1)
cln_nmb<-which(colnames(dataset)==decision_name)
formula_general<-as.formula(paste(decision_name, "~."))
```

```r
#Base Decision tree
base_tree<- rpart(formula=formula_general, data =training_set,method ="class",control = rpart.control(


#Base Decision tree  prediction
predict(base_tree, newdata=test_set ,type="class")->pred_base_tr

#Preprune decision tree

hr_model_preprun<-rpart(formula_general, data = training_set , method = "class", control = rpart.contro
#Preprune decision tree prediction
predict( hr_model_preprun , newdata=test_set, type="class")->pred_preprun_tr
#Postpruning decision tree
cp.optim <- base_tree$cptable[which.min(base_tree$cptable[,"xerror"]),"CP"]
hr_model_pruned <- prune(base_tree,control = rpart.control( minbucket = 20/3, minsplit = 20, maxdepth =
#Postpruning decision tree prediction
predict( hr_model_pruned , newdata=test_set, type="class")->pred_postprun_tr
#formula creation
formula<-as.formula(paste(decision_name, paste(atrybuty_istotne, collapse=" + "), sep=" ~ "))
print(formula)
#Selected attribute model
model_attr<-rpart(formula,data=training_set,method = "class")
#Selected attribute model predict
predict(model_attr, newdata=test_set[atrybuty_istotne],type="class")->pred_select_attr


#Prediction matrix Base Decision tree
base_tr_md<-table(test_set[,cln_nmb], pred_base_tr )
print("Prediction matrix Base Decision tree ")
print(base_tr_md)
#Prediction matrix Preprune decision tree
preprun_tr_md<-table(test_set[,cln_nmb], pred_preprun_tr )
print("Prediction matrix Preprune decision tree")
print(preprun_tr_md)
#Prediction matrix Postpruning decision tree
postprun_tr_md<-table(test_set[,cln_nmb], pred_postprun_tr )
print("Prediction matrix Postpruning decision tree")
print(postprun_tr_md)
#Prediction matrix Selected attribute model
selected_tr_md<-table(test_set[,cln_nmb], pred_select_attr )
print("Prediction matrix Selected attribute model")
print(selected_tr_md)
#Model error
err_base_tr<-(sum( diag (base_tr_md ) ) /sum(base_tr_md ) )
err_preprun_tr<-(sum( diag (preprun_tr_md ) ) /sum(preprun_tr_md ) )
err_postprun_tr<-(sum( diag (postprun_tr_md ) ) /sum(postprun_tr_md ) )
err_selected_tr<-(sum( diag (selected_tr_md ) ) /sum(selected_tr_md ) )

wyniki_badan1[j+1,i*2-1]<-round(err_base_tr,3)
wyniki_badan1[j+1,i*2]<-round(err_preprun_tr,3)
wyniki_badan2[j+1,i*2-1]<-round(err_postprun_tr,3)
wyniki_badan2[j+1,i*2]<-round(err_selected_tr,3)
```

```
}
rpart.plot(base_tree,  main=paste("Full Tree", nazwa_bazy))
rpart.plot(hr_model_preprun,  main=paste("Prepruned Decision Tree", nazwa_bazy))
rpart.plot(hr_model_pruned,  main=paste("Postpruned Decision Tree", nazwa_bazy))

podsumowenia_wynikow[i,2] <-paste(round(mean(as.numeric(wyniki_badan1[2:j, i*2-1]))* 100, 2 ), "%")
podsumowenia_wynikow[i,3] <-paste(round(mean(as.numeric(wyniki_badan1[2:j, i*2]))* 100, 2 ), "%")
podsumowenia_wynikow[i,4] <-paste(round(mean(as.numeric(wyniki_badan2[2:j, i*2-1]))* 100, 2 ), "%")
podsumowenia_wynikow[i,5] <-paste(round(mean(as.numeric(wyniki_badan2[2:j, i*2]))* 100, 2 ), "%")

}
```

```
## [1] "==========  Wstępna analiza danych bazy: ========== abalone.csv"
## [1] "==========  Summary: ========== abalone.csv"
##       Sex            Length          Diameter           Height
##  Min.   :1.000   Min.   :0.075   Min.   :0.0550   Min.   :0.0000
##  1st Qu.:1.000   1st Qu.:0.450   1st Qu.:0.3500   1st Qu.:0.1150
##  Median :2.000   Median :0.545   Median :0.4250   Median :0.1400
##  Mean   :2.053   Mean   :0.524   Mean   :0.4079   Mean   :0.1395
##  3rd Qu.:3.000   3rd Qu.:0.615   3rd Qu.:0.4800   3rd Qu.:0.1650
##  Max.   :3.000   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
##       age
##  Min.   :1.000
##  1st Qu.:1.000
##  Median :1.000
##  Mean   :1.208
##  3rd Qu.:1.000
##  Max.   :3.000
## [1] "****************************************************"
## [1] "****************************************************"
## [1] "****************************************************"
## [1] "==========  Structure: ========== abalone.csv"
## 'data.frame':    4177 obs. of  9 variables:
##  $ Sex          : int  3 3 1 3 2 2 1 1 3 1 ...
##  $ Length       : num  0.455 0.35 0.53 0.44 0.33 0.425 0.53 0.545 0.475 0.55 ...
##  $ Diameter     : num  0.365 0.265 0.42 0.365 0.255 0.3 0.415 0.425 0.37 0.44 ...
##  $ Height       : num  0.095 0.09 0.135 0.125 0.08 0.095 0.15 0.125 0.125 0.15 ...
##  $ Whole_weight : num  0.514 0.226 0.677 0.516 0.205 ...
##  $ Shucked_weight: num  0.2245 0.0995 0.2565 0.2155 0.0895 ...
##  $ Viscera_weight: num  0.101 0.0485 0.1415 0.114 0.0395 ...
##  $ Shell_weight : num  0.15 0.07 0.21 0.155 0.055 0.12 0.33 0.26 0.165 0.32 ...
##  $ age          : int  2 1 1 1 1 1 2 2 1 2 ...
## NULL
## [1] "****************************************************"
## [1] "****************************************************"
## [1] "****************************************************"
```

```
## [1] "****************************************************"
## [1] "==========  Attribute data type: ==========  abalone.csv"
##             Sex          Length        Diameter         Height    Whole_weight
##        "integer"       "numeric"       "numeric"      "numeric"       "numeric"
## Shucked_weight Viscera_weight   Shell_weight             age
##        "numeric"       "numeric"       "numeric"      "integer"
## [1] "****************************************************"
## [1] "****************************************************"
## [1] "****************************************************"
## [1] "****************************************************"
## [1] "==========  First samples: ==========  abalone.csv"
##   Sex Length Diameter Height Whole_weight Shucked_weight Viscera_weight
## 1   3  0.455    0.365  0.095       0.5140         0.2245         0.1010
## 2   3  0.350    0.265  0.090       0.2255         0.0995         0.0485
## 3   1  0.530    0.420  0.135       0.6770         0.2565         0.1415
## 4   3  0.440    0.365  0.125       0.5160         0.2155         0.1140
## 5   2  0.330    0.255  0.080       0.2050         0.0895         0.0395
## 6   2  0.425    0.300  0.095       0.3515         0.1410         0.0775
##   Shell_weight age
## 1        0.150   2
## 2        0.070   1
## 3        0.210   1
## 4        0.155   1
## 5        0.055   1
## 6        0.120   1
## [1] "****************************************************"
## [1] "****************************************************"
## [1] "****************************************************"
## [1] "==========  Last samples: ==========  abalone.csv"
##       Sex Length Diameter Height Whole_weight Shucked_weight Viscera_weight
## 4172    3  0.560    0.430  0.155       0.8675         0.4000         0.1720
## 4173    1  0.565    0.450  0.165       0.8870         0.3700         0.2390
## 4174    3  0.590    0.440  0.135       0.9660         0.4390         0.2145
## 4175    3  0.600    0.475  0.205       1.1760         0.5255         0.2875
## 4176    1  0.625    0.485  0.150       1.0945         0.5310         0.2610
## 4177    3  0.710    0.555  0.195       1.9485         0.9455         0.3765
##       Shell_weight age
## 4172        0.2290   1
## 4173        0.2490   1
## 4174        0.2605   1
## 4175        0.3080   1
## 4176        0.2960   1
## 4177        0.4950   1
## [1] "****************************************************"
## [1] "****************************************************"
## [1] "****************************************************"
## [1] "****************************************************"
## [1] "==========  Dataset Dimenssions: ==========  abalone.csv"
## [1] 4177    9
## [1] "==========  Histogram Plot of  Decision Classes: ==========  abalone.csv"
```
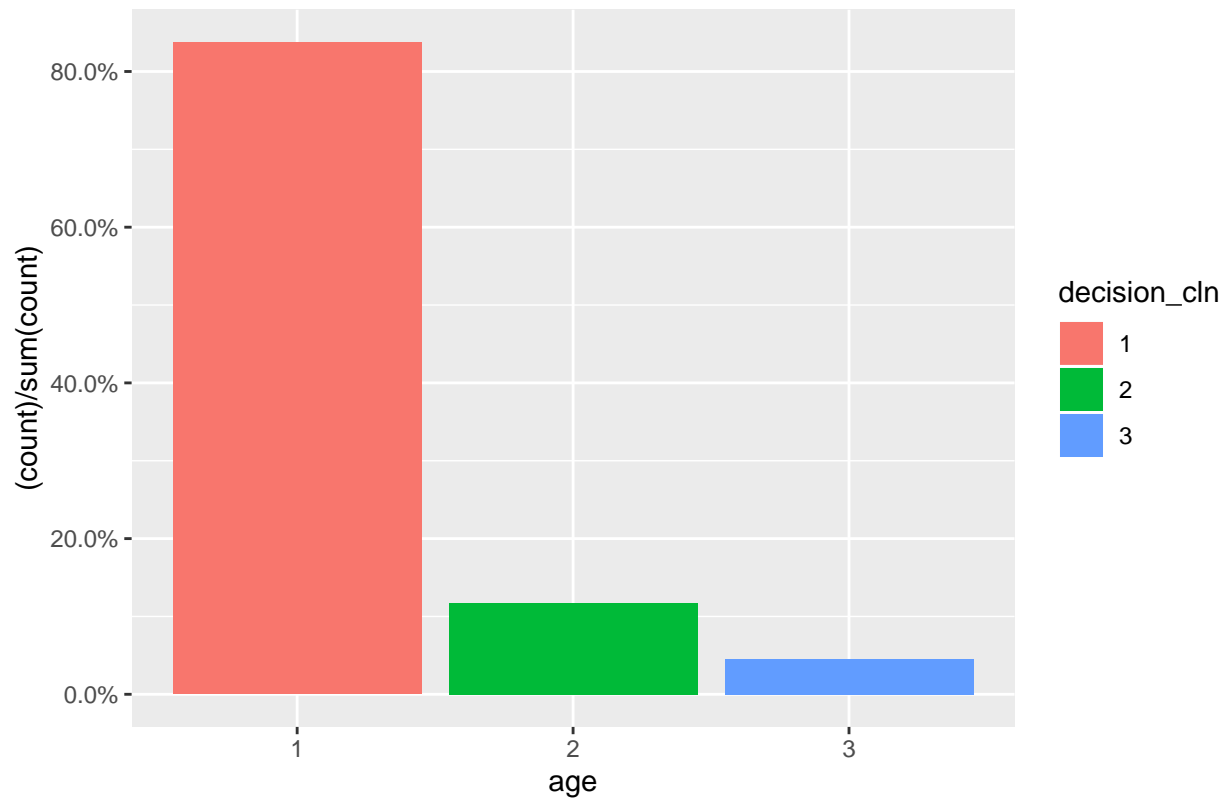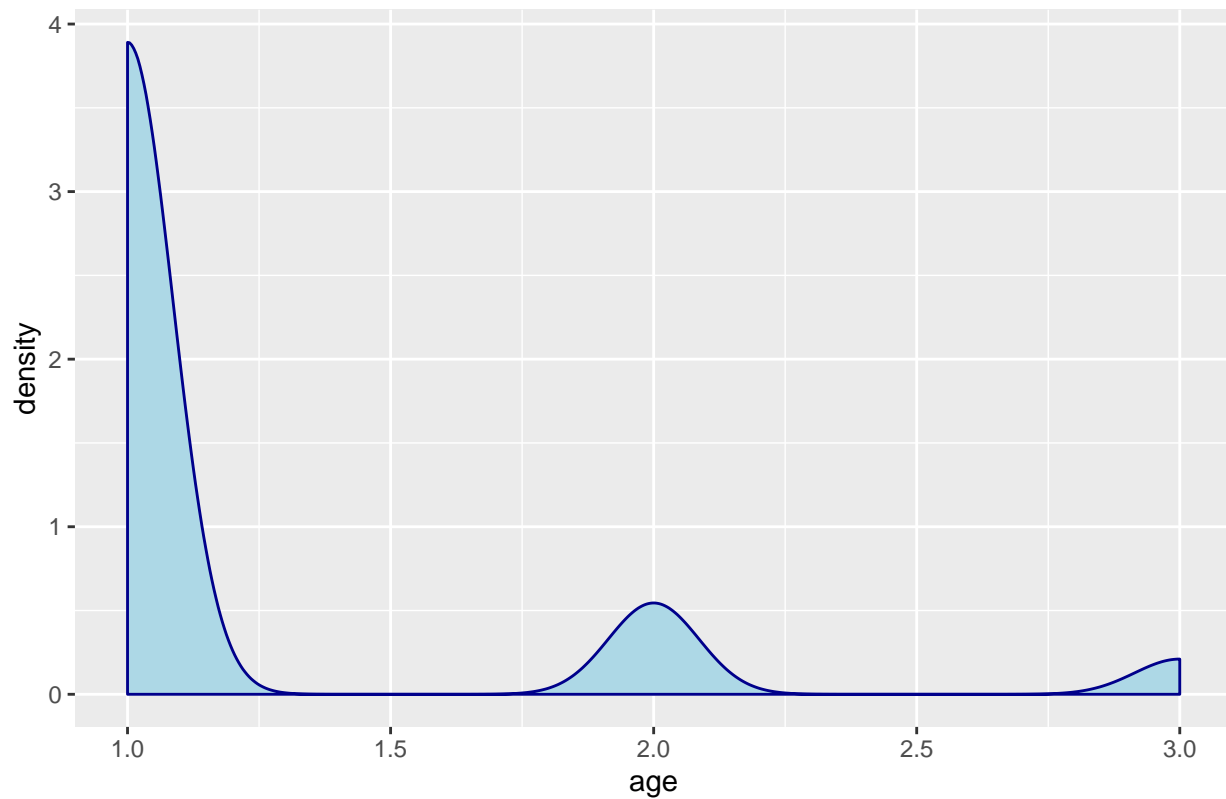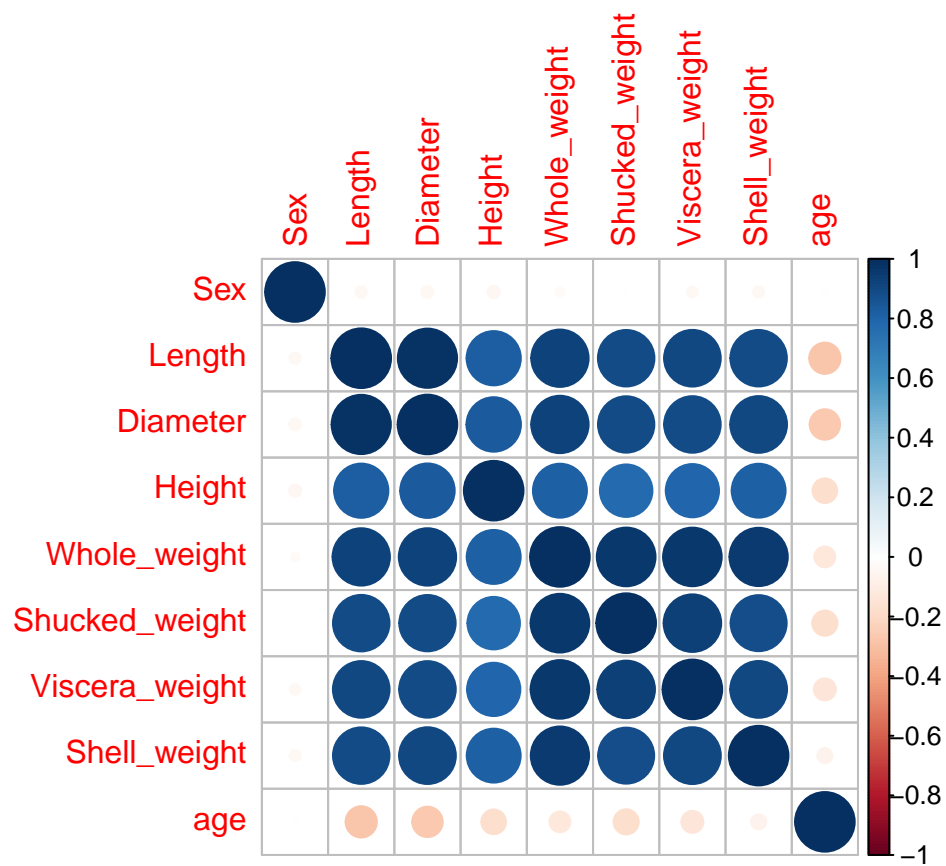
wykres atrybutu decyzji abalone.csv


```
## [1] "==========  Desity Plot of  Decision Classes: ========== abalone.csv"
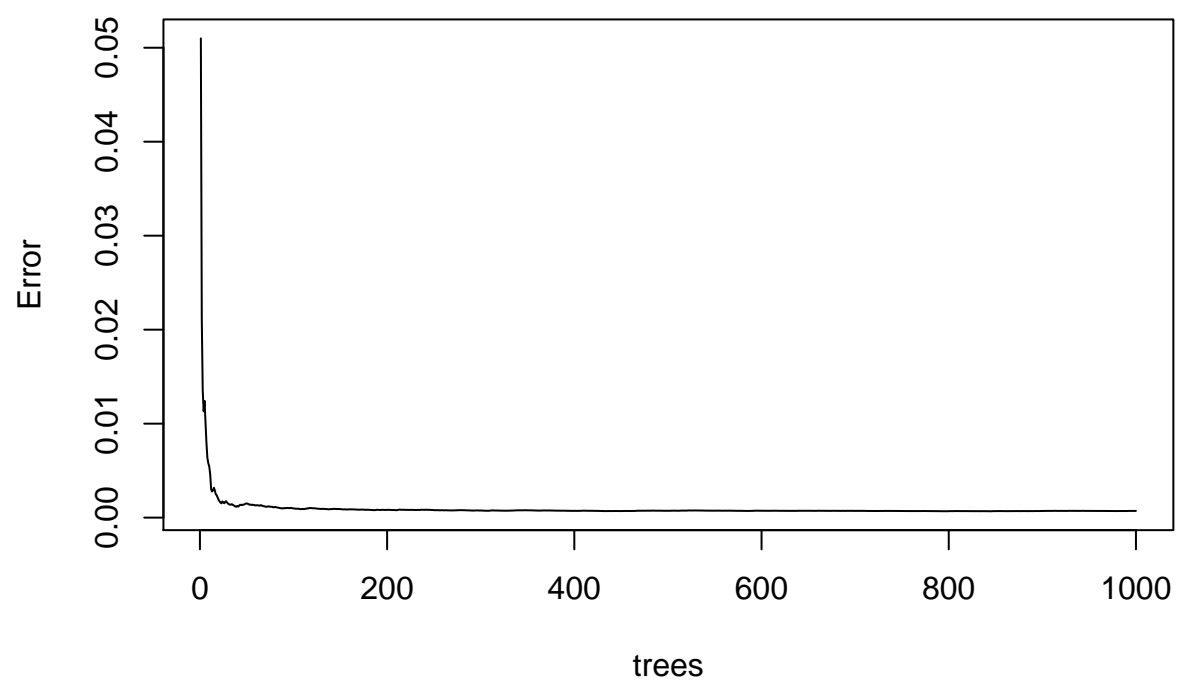```

## wykres atrybutu decyzji abalone.csv



```
[1] "========== Correlation Plot of Dataframe: ========== abalone.csv"
```
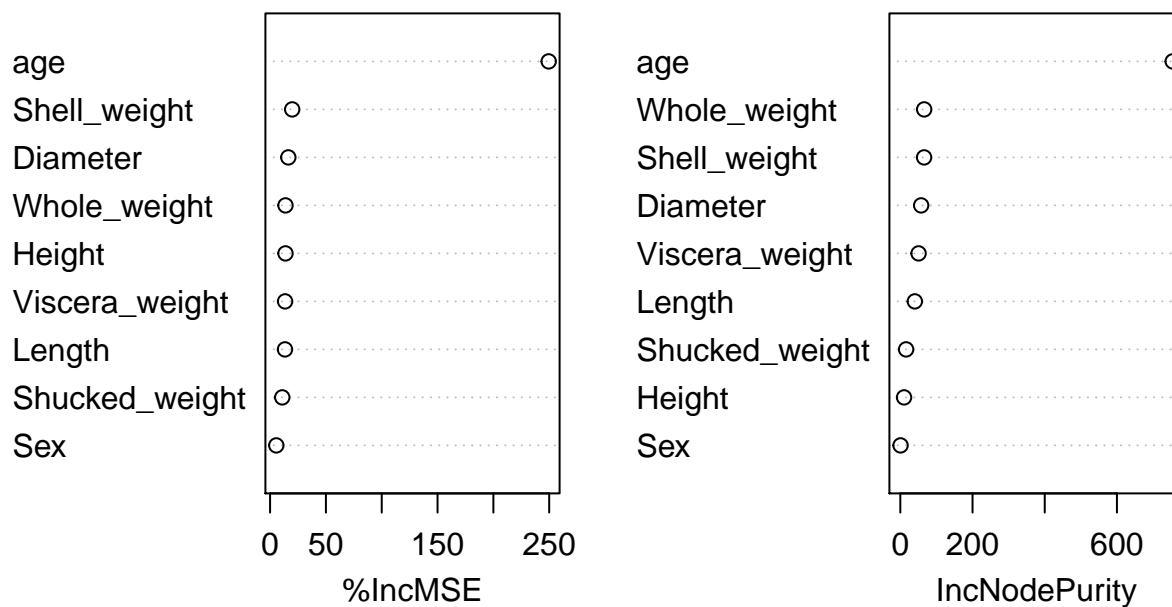
```
Warning in randomForest.default(m, y, ...): The response has five or fewer
unique values. Are you sure you want to do regression?
```

**Baza abalone.csv**

trees

# Baza abalone.csv



```
## age ~ Length + Diameter + Whole_weight + Viscera_weight + Shell_weight
## [1] "Prediction matrix Base Decision tree "
##    pred_base_tr
##       1   2   3
##   1 934  90  32
##   2  95  50   0
##   3  17   0  36
## [1] "Prediction matrix Preprune decision tree"
##    pred_preprun_tr
##       1   2   3
##   1 1008  23  25
##   2  119  26   0
##   3   10   0  43
## [1] "Prediction matrix Postpruning decision tree"
##    pred_postprun_tr
##       1   2   3
##   1 1009  31  16
##   2  108  37   0
##   3   18   0  35
## [1] "Prediction matrix Selected attribute model"
##    pred_select_attr
##       1   2   3
##   1 1012  19  25
##   2  130  15   0
##   3   10   0  43
## age ~ Length + Diameter + Whole_weight + Viscera_weight + Shell_weight
```

```
## [1] "Prediction matrix Base Decision tree "
##    pred_base_tr
##       1   2   3
##   1 964  76  28
##   2  96  44   0
##   3  18   0  28
## [1] "Prediction matrix Preprune decision tree"
##    pred_preprun_tr
##        1   2   3
##   1 1025  18  25
##   2  116  24   0
##   3   11   0  35
## [1] "Prediction matrix Postpruning decision tree"
##    pred_postprun_tr
##        1   2   3
##   1 1023  31  14
##   2  101  39   0
##   3   20   0  26
## [1] "Prediction matrix Selected attribute model"
##    pred_select_attr
##        1   2   3
##   1 1033  10  25
##   2  128  12   0
##   3   11   0  35
## age ~ Length + Diameter + Whole_weight + Viscera_weight + Shell_weight
## [1] "Prediction matrix Base Decision tree "
##    pred_base_tr
##       1   2   3
##   1 931 108  20
##   2  84  57   0
##   3  23   0  31
## [1] "Prediction matrix Preprune decision tree"
##    pred_preprun_tr
##        1   2   3
##   1 1022  28   9
##   2  110  31   0
##   3   18   0  36
## [1] "Prediction matrix Postpruning decision tree"
##    pred_postprun_tr
##       1   2   3
##   1 996  56   7
##   2  91  50   0
##   3  23   0  31
## [1] "Prediction matrix Selected attribute model"
##    pred_select_attr
##        1   2   3
##   1 1042   8   9
##   2  126  15   0
##   3   18   0  36
## age ~ Length + Diameter + Whole_weight + Viscera_weight + Shell_weight
## [1] "Prediction matrix Base Decision tree "
##    pred_base_tr
##       1   2   3
##   1 925  93  20
```

```
##    2  88  66   0
##    3  29   0  33
## [1] "Prediction matrix Preprune decision tree"
##     pred_preprun_tr
##        1    2    3
##    1 997   18   23
##    2 118   36    0
##    3  15    0   47
## [1] "Prediction matrix Postpruning decision tree"
##     pred_postprun_tr
##         1    2    3
##    1 1001   21   16
##    2  118   36    0
##    3   22    0   40
## [1] "Prediction matrix Selected attribute model"
##     pred_select_attr
##        1    2    3
##    1 981   34   23
##    2 122   32    0
##    3  15    0   47
## age ~ Length + Diameter + Whole_weight + Viscera_weight + Shell_weight
## [1] "Prediction matrix Base Decision tree "
##     pred_base_tr
##        1    2    3
##    1 940   93   17
##    2  94   51    0
##    3  27    0   32
## [1] "Prediction matrix Preprune decision tree"
##     pred_preprun_tr
##         1    2    3
##    1 1011   21   18
##    2  102   43    0
##    3   15    0   44
## [1] "Prediction matrix Postpruning decision tree"
##     pred_postprun_tr
##         1    2    3
##    1 1022   10   18
##    2  116   29    0
##    3   15    0   44
## [1] "Prediction matrix Selected attribute model"
##     pred_select_attr
##         1    2    3
##    1 1026    6   18
##    2  134   11    0
##    3   15    0   44
## age ~ Length + Diameter + Whole_weight + Viscera_weight + Shell_weight
## [1] "Prediction matrix Base Decision tree "
##     pred_base_tr
##        1    2    3
##    1 906  102   27
##    2  89   67    0
##    3  29    0   34
## [1] "Prediction matrix Preprune decision tree"
##     pred_preprun_tr
```

```
##           1    2    3
##    1 1000   17   18
##    2  123   33    0
##    3   24    0   39
## [1] "Prediction matrix Postpruning decision tree"
##     pred_postprun_tr
##           1    2    3
##    1  988   35   12
##    2  107   49    0
##    3   32    0   31
## [1] "Prediction matrix Selected attribute model"
##     pred_select_attr
##           1    2    3
##    1 1007   10   18
##    2  130   26    0
##    3   24    0   39
## age ~ Length + Diameter + Whole_weight + Viscera_weight + Shell_weight
## [1] "Prediction matrix Base Decision tree "
##     pred_base_tr
##          1    2    3
##    1 933   97   18
##    2  94   49    0
##    3  30    0   33
## [1] "Prediction matrix Preprune decision tree"
##     pred_preprun_tr
##           1    2    3
##    1 1008   26   14
##    2  112   31    0
##    3   22    0   41
## [1] "Prediction matrix Postpruning decision tree"
##     pred_postprun_tr
##           1    2    3
##    1 1008   26   14
##    2  112   31    0
##    3   22    0   41
## [1] "Prediction matrix Selected attribute model"
##     pred_select_attr
##           1    2    3
##    1 1020   14   14
##    2  121   22    0
##    3   22    0   41
## age ~ Length + Diameter + Whole_weight + Viscera_weight + Shell_weight
## [1] "Prediction matrix Base Decision tree "
##     pred_base_tr
##          1    2    3
##    1 889  113   29
##    2  97   58    0
##    3  23    0   45
## [1] "Prediction matrix Preprune decision tree"
##     pred_preprun_tr
##          1    2    3
##    1 972   37   22
##    2 117   38    0
##    3  21    0   47
```

```
## [1] "Prediction matrix Postpruning decision tree"
##    pred_postprun_tr
##        1   2   3
##   1 972  37  22
##   2 121  34   0
##   3  21   0  47
## [1] "Prediction matrix Selected attribute model"
##    pred_select_attr
##        1   2   3
##   1 981  28  22
##   2 125  30   0
##   3  21   0  47
## age ~ Length + Diameter + Whole_weight + Viscera_weight + Shell_weight
## [1] "Prediction matrix Base Decision tree "
##    pred_base_tr
##        1   2   3
##   1 946  87  25
##   2  99  50   0
##   3  25   0  22
## [1] "Prediction matrix Preprune decision tree"
##    pred_preprun_tr
##         1    2    3
##   1 1002   29   27
##   2  114   35    0
##   3   16    0   31
## [1] "Prediction matrix Postpruning decision tree"
##    pred_postprun_tr
##         1    2    3
##   1 1013   33   12
##   2  112   37    0
##   3   22    0   25
## [1] "Prediction matrix Selected attribute model"
##    pred_select_attr
##         1    2    3
##   1 1025    6   27
##   2  141    8    0
##   3   16    0   31
## age ~ Length + Diameter + Whole_weight + Viscera_weight + Shell_weight
## [1] "Prediction matrix Base Decision tree "
##    pred_base_tr
##        1   2   3
##   1 952  89  17
##   2  89  57   0
##   3  17   0  33
## [1] "Prediction matrix Preprune decision tree"
##    pred_preprun_tr
##         1    2    3
##   1 1034   13   11
##   2  126   20    0
##   3   13    0   37
## [1] "Prediction matrix Postpruning decision tree"
##    pred_postprun_tr
##         1    2    3
##   1 1037   17    4
```

```
##   2 125   21    0
##   3  22    0   28
## [1] "Prediction matrix Selected attribute model"
##    pred_select_attr
##        1    2    3
##   1 1038   6   14
##   2  139   7    0
##   3   12   0   38
## age ~ Length + Diameter + Whole_weight + Viscera_weight + Shell_weight
## [1] "Prediction matrix Base Decision tree "
##    pred_base_tr
##        1    2    3
##   1 921   90   35
##   2 104   52    0
##   3  17    0   35
## [1] "Prediction matrix Preprune decision tree"
##    pred_preprun_tr
##        1    2    3
##   1 1012   13   21
##   2  126   30    0
##   3   13    0   39
## [1] "Prediction matrix Postpruning decision tree"
##    pred_postprun_tr
##        1    2    3
##   1 1014   11   21
##   2  127   29    0
##   3   13    0   39
## [1] "Prediction matrix Selected attribute model"
##    pred_select_attr
##        1    2    3
##   1 1016    9   21
##   2  136   20    0
##   3   13    0   39
## age ~ Length + Diameter + Whole_weight + Viscera_weight + Shell_weight
## [1] "Prediction matrix Base Decision tree "
##    pred_base_tr
##        1    2    3
##   1 920   86   31
##   2 110   54    0
##   3  26    0   27
## [1] "Prediction matrix Preprune decision tree"
##    pred_preprun_tr
##        1    2    3
##   1 1014    9   14
##   2  142   22    0
##   3   25    0   28
## [1] "Prediction matrix Postpruning decision tree"
##    pred_postprun_tr
##        1    2    3
##   1 1007   16   14
##   2  131   33    0
##   3   25    0   28
## [1] "Prediction matrix Selected attribute model"
##    pred_select_attr
```

```
##        1    2    3
##    1 1011   12   14
##    2  144   20    0
##    3   25    0   28
## age ~ Length + Diameter + Whole_weight + Viscera_weight + Shell_weight
## [1] "Prediction matrix Base Decision tree "
##     pred_base_tr
##       1    2    3
##    1 903   99   41
##    2 106   53    0
##    3  18    0   34
## [1] "Prediction matrix Preprune decision tree"
##     pred_preprun_tr
##       1    2    3
##    1 984   33   26
##    2 120   39    0
##    3  11    0   41
## [1] "Prediction matrix Postpruning decision tree"
##     pred_postprun_tr
##       1    2    3
##    1 984   33   26
##    2 120   39    0
##    3  11    0   41
## [1] "Prediction matrix Selected attribute model"
##     pred_select_attr
##       1    2    3
##    1 990   27   26
##    2 134   25    0
##    3  11    0   41
## age ~ Length + Diameter + Whole_weight + Viscera_weight + Shell_weight
## [1] "Prediction matrix Base Decision tree "
##     pred_base_tr
##       1    2    3
##    1 928  102   26
##    2  88   53    0
##    3  23    0   34
## [1] "Prediction matrix Preprune decision tree"
##     pred_preprun_tr
##        1    2    3
##    1 1024   17   15
##    2  116   25    0
##    3   19    0   38
## [1] "Prediction matrix Postpruning decision tree"
##     pred_postprun_tr
##       1    2    3
##    1 991   51   14
##    2  91   50    0
##    3  19    0   38
## [1] "Prediction matrix Selected attribute model"
##     pred_select_attr
##        1    2    3
##    1 1030   11   15
##    2  126   15    0
##    3   19    0   38
```

```
## age ~ Length + Diameter + Whole_weight + Viscera_weight + Shell_weight
## [1] "Prediction matrix Base Decision tree "
##    pred_base_tr
##        1   2   3
##   1 947  81  19
##   2  81  62   0
##   3  20   0  44
## [1] "Prediction matrix Preprune decision tree"
##    pred_preprun_tr
##        1   2   3
##   1 1016  25   6
##   2  115  28   0
##   3   28   0  36
## [1] "Prediction matrix Postpruning decision tree"
##    pred_postprun_tr
##        1   2   3
##   1 1009  31   7
##   2  104  39   0
##   3   25   0  39
## [1] "Prediction matrix Selected attribute model"
##    pred_select_attr
##        1   2   3
##   1 1017  30   0
##   2  119  24   0
##   3   33   0  31
## age ~ Length + Diameter + Whole_weight + Viscera_weight + Shell_weight
## [1] "Prediction matrix Base Decision tree "
##    pred_base_tr
##        1   2   3
##   1 936  89  25
##   2  90  60   0
##   3  21   0  33
## [1] "Prediction matrix Preprune decision tree"
##    pred_preprun_tr
##        1   2   3
##   1 1022   8  20
##   2  124  26   0
##   3   16   0  38
## [1] "Prediction matrix Postpruning decision tree"
##    pred_postprun_tr
##        1   2   3
##   1 1020  21   9
##   2  112  38   0
##   3   24   0  30
## [1] "Prediction matrix Selected attribute model"
##    pred_select_attr
##        1   2   3
##   1 1019  11  20
##   2  122  28   0
##   3   16   0  38
## age ~ Length + Diameter + Whole_weight + Viscera_weight + Shell_weight
## [1] "Prediction matrix Base Decision tree "
##    pred_base_tr
##        1   2   3
```

```
##   1 903 112  23
##   2  82  65   0
##   3  25   0  44
## [1] "Prediction matrix Preprune decision tree"
##    pred_preprun_tr
##       1   2   3
##   1 972  44  22
##   2  99  48   0
##   3  15   0  54
## [1] "Prediction matrix Postpruning decision tree"
##    pred_postprun_tr
##       1   2   3
##   1 995  41   2
##   2 102  45   0
##   3  34   0  35
## [1] "Prediction matrix Selected attribute model"
##    pred_select_attr
##        1   2   3
##   1 1002  14  22
##   2  132  15   0
##   3   15   0  54
## age ~ Length + Diameter + Whole_weight + Viscera_weight + Shell_weight
## [1] "Prediction matrix Base Decision tree "
##    pred_base_tr
##       1   2   3
##   1 932  98  21
##   2  85  61   0
##   3  21   0  36
## [1] "Prediction matrix Preprune decision tree"
##    pred_preprun_tr
##        1   2   3
##   1 1014  23  14
##   2  116  30   0
##   3   15   0  42
## [1] "Prediction matrix Postpruning decision tree"
##    pred_postprun_tr
##        1   2   3
##   1 1011  30  10
##   2  100  46   0
##   3   22   0  35
## [1] "Prediction matrix Selected attribute model"
##    pred_select_attr
##        1   2   3
##   1 1033   4  14
##   2  133  13   0
##   3   15   0  42
## age ~ Length + Diameter + Whole_weight + Viscera_weight + Shell_weight
## [1] "Prediction matrix Base Decision tree "
##    pred_base_tr
##       1   2   3
##   1 946  89  16
##   2  97  54   0
##   3  17   0  35
## [1] "Prediction matrix Preprune decision tree"
```

```
##    pred_preprun_tr
##       1   2   3
##   1 1010  24  17
##   2  125  26   0
##   3   16   0  36
## [1] "Prediction matrix Postpruning decision tree"
##    pred_postprun_tr
##       1   2   3
##   1 1010  24  17
##   2  125  26   0
##   3   16   0  36
## [1] "Prediction matrix Selected attribute model"
##    pred_select_attr
##       1   2   3
##   1 1013  21  17
##   2  129  22   0
##   3   16   0  36
## age ~ Length + Diameter + Whole_weight + Viscera_weight + Shell_weight
## [1] "Prediction matrix Base Decision tree "
##    pred_base_tr
##       1   2   3
##   1 939  94  25
##   2  86  58   0
##   3  22   0  30
## [1] "Prediction matrix Preprune decision tree"
##    pred_preprun_tr
##       1   2   3
##   1 1017  17  24
##   2  114  30   0
##   3   20   0  32
## [1] "Prediction matrix Postpruning decision tree"
##    pred_postprun_tr
##       1   2   3
##   1 1017  17  24
##   2  114  30   0
##   3   20   0  32
## [1] "Prediction matrix Selected attribute model"
##    pred_select_attr
##       1   2   3
##   1 1024  10  24
##   2  124  20   0
##   3   20   0  32
## age ~ Length + Diameter + Whole_weight + Viscera_weight + Shell_weight
## [1] "Prediction matrix Base Decision tree "
##    pred_base_tr
##       1   2   3
##   1 939  73  26
##   2 104  62   0
##   3  23   0  27
## [1] "Prediction matrix Preprune decision tree"
##    pred_preprun_tr
##       1   2   3
##   1 1004  23  11
##   2  131  35   0
```

```
##    3   27    0    23
## [1] "Prediction matrix Postpruning decision tree"
##     pred_postprun_tr
##        1    2    3
##   1 1004   23   11
##   2  131   35    0
##   3   27    0   23
## [1] "Prediction matrix Selected attribute model"
##     pred_select_attr
##        1    2    3
##   1 1024    2   12
##   2  158    8    0
##   3   25    0   25
## age ~ Length + Diameter + Whole_weight + Viscera_weight + Shell_weight
## [1] "Prediction matrix Base Decision tree "
##     pred_base_tr
##        1    2    3
##   1  910  107   22
##   2   94   58    0
##   3   24    0   39
## [1] "Prediction matrix Preprune decision tree"
##     pred_preprun_tr
##        1    2    3
##   1  998   24   17
##   2  118   34    0
##   3   18    0   45
## [1] "Prediction matrix Postpruning decision tree"
##     pred_postprun_tr
##        1    2    3
##   1  998   24   17
##   2  118   34    0
##   3   18    0   45
## [1] "Prediction matrix Selected attribute model"
##     pred_select_attr
##        1    2    3
##   1  994   28   17
##   2  129   23    0
##   3   18    0   45
## age ~ Length + Diameter + Whole_weight + Viscera_weight + Shell_weight
## [1] "Prediction matrix Base Decision tree "
##     pred_base_tr
##        1    2    3
##   1  915  101   26
##   2  103   53    0
##   3   21    0   35
## [1] "Prediction matrix Preprune decision tree"
##     pred_preprun_tr
##        1    2    3
##   1 1006   20   16
##   2  115   41    0
##   3   17    0   39
## [1] "Prediction matrix Postpruning decision tree"
##     pred_postprun_tr
##        1    2    3
```

```
##   1 1006   20   16
##   2  115   41    0
##   3   17    0   39
## [1] "Prediction matrix Selected attribute model"
##     pred_select_attr
##          1    2    3
##   1 1002   24   16
##   2  125   31    0
##   3   17    0   39
## age ~ Length + Diameter + Whole_weight + Viscera_weight + Shell_weight
## [1] "Prediction matrix Base Decision tree "
##     pred_base_tr
##         1    2    3
##   1 922 101   19
##   2  88   63    0
##   3  22    0   39
## [1] "Prediction matrix Preprune decision tree"
##     pred_preprun_tr
##          1    2    3
##   1 1007   32    3
##   2   99   52    0
##   3   28    0   33
## [1] "Prediction matrix Postpruning decision tree"
##     pred_postprun_tr
##         1    2    3
##   1 998   36    8
##   2  95   56    0
##   3  19    0   42
## [1] "Prediction matrix Selected attribute model"
##     pred_select_attr
##          1    2    3
##   1 1031    8    3
##   2  136   15    0
##   3   28    0   33
## age ~ Length + Diameter + Whole_weight + Viscera_weight + Shell_weight
## [1] "Prediction matrix Base Decision tree "
##     pred_base_tr
##          1    2    3
##   1 936 108   23
##   2  82   59    0
##   3  22    0   24
## [1] "Prediction matrix Preprune decision tree"
##     pred_preprun_tr
##          1    2    3
##   1 1008   38   21
##   2  108   33    0
##   3   20    0   26
## [1] "Prediction matrix Postpruning decision tree"
##     pred_postprun_tr
##          1    2    3
##   1 1025   34    8
##   2  104   37    0
##   3   25    0   21
## [1] "Prediction matrix Selected attribute model"
```

```
##    pred_select_attr
##        1    2    3
##   1 1041    5   21
##   2  134    7    0
##   3   20    0   26
## age ~ Length + Diameter + Whole_weight + Viscera_weight + Shell_weight
## [1] "Prediction matrix Base Decision tree "
##    pred_base_tr
##        1    2    3
##   1  962   85   24
##   2   70   57    0
##   3   22    0   34
## [1] "Prediction matrix Preprune decision tree"
##    pred_preprun_tr
##        1    2    3
##   1 1034   22   15
##   2  100   27    0
##   3   19    0   37
## [1] "Prediction matrix Postpruning decision tree"
##    pred_postprun_tr
##        1    2    3
##   1 1028   34    9
##   2   88   39    0
##   3   28    0   28
## [1] "Prediction matrix Selected attribute model"
##    pred_select_attr
##        1    2    3
##   1 1034   22   15
##   2  104   23    0
##   3   19    0   37
## age ~ Length + Diameter + Whole_weight + Viscera_weight + Shell_weight
## [1] "Prediction matrix Base Decision tree "
##    pred_base_tr
##        1    2    3
##   1  914  103   26
##   2  109   47    0
##   3   24    0   31
## [1] "Prediction matrix Preprune decision tree"
##    pred_preprun_tr
##        1    2    3
##   1  969   56   18
##   2  101   55    0
##   3   17    0   38
## [1] "Prediction matrix Postpruning decision tree"
##    pred_postprun_tr
##        1    2    3
##   1  982   42   19
##   2  109   47    0
##   3   25    0   30
## [1] "Prediction matrix Selected attribute model"
##    pred_select_attr
##        1    2    3
##   1  993   32   18
##   2  130   26    0
```
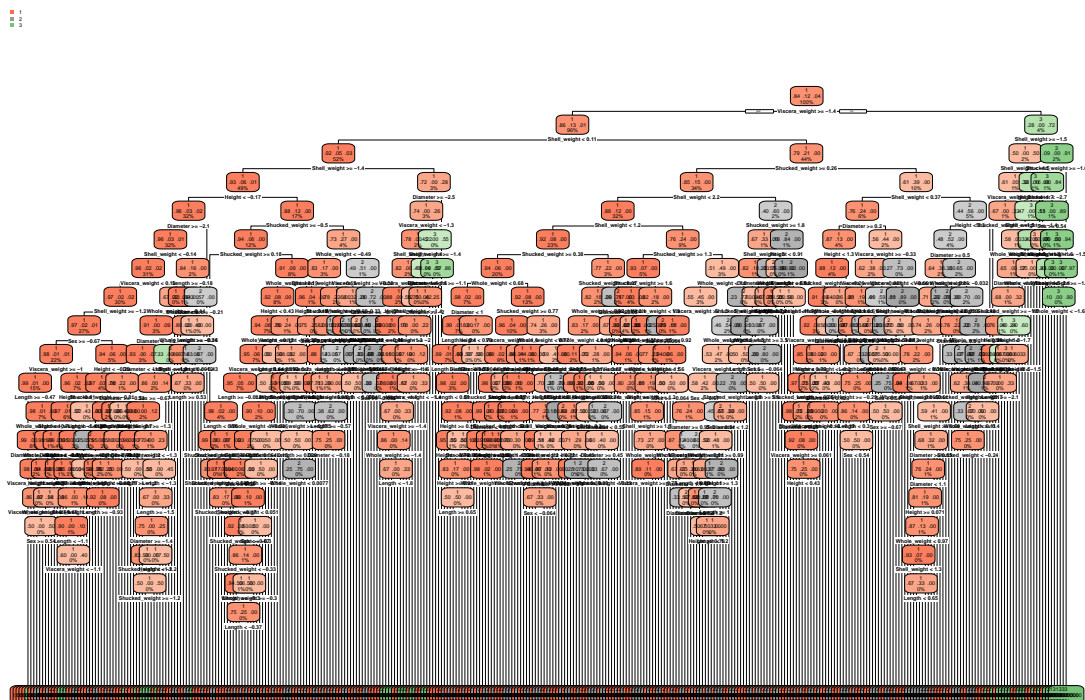
```
##   3  17   0  38
## age ~ Length + Diameter + Whole_weight + Viscera_weight + Shell_weight
## [1] "Prediction matrix Base Decision tree "
##     pred_base_tr
##       1   2   3
##   1 912  98  19
##   2 107  61   0
##   3  26   0  31
## [1] "Prediction matrix Preprune decision tree"
##     pred_preprun_tr
##        1   2   3
##   1 1014   5  10
##   2  143  25   0
##   3   22   0  35
## [1] "Prediction matrix Postpruning decision tree"
##     pred_postprun_tr
##        1   2   3
##   1 1010  12   7
##   2  122  46   0
##   3   25   0  32
## [1] "Prediction matrix Selected attribute model"
##     pred_select_attr
##        1   2   3
##   1 1015   4  10
##   2  150  18   0
##   3   22   0  35
## age ~ Length + Diameter + Whole_weight + Viscera_weight + Shell_weight
## [1] "Prediction matrix Base Decision tree "
##     pred_base_tr
##       1   2   3
##   1 951  89  20
##   2  85  64   0
##   3  20   0  25
## [1] "Prediction matrix Preprune decision tree"
##     pred_preprun_tr
##        1   2   3
##   1 1033  21   6
##   2  128  21   0
##   3   18   0  27
## [1] "Prediction matrix Postpruning decision tree"
##     pred_postprun_tr
##        1   2   3
##   1 1036  18   6
##   2  129  20   0
##   3   19   0  26
## [1] "Prediction matrix Selected attribute model"
##     pred_select_attr
##        1   2   3
##   1 1050   5   5
##   2  134  15   0
##   3   19   0  26
## age ~ Length + Diameter + Whole_weight + Viscera_weight + Shell_weight
## [1] "Prediction matrix Base Decision tree "
##     pred_base_tr
```

```
##      1   2   3
##   1 940  88  26
##   2  82  58   0
##   3  19   0  41
## [1] "Prediction matrix Preprune decision tree"
##    pred_preprun_tr
##       1   2   3
##   1 1013  28  13
##   2  111  29   0
##   3   19   0  41
## [1] "Prediction matrix Postpruning decision tree"
##    pred_postprun_tr
##       1   2   3
##   1 1019  22  13
##   2  114  26   0
##   3   19   0  41
## [1] "Prediction matrix Selected attribute model"
##    pred_select_attr
##       1   2   3
##   1 1024  17  13
##   2  120  20   0
##   3   19   0  41
```

```
## Warning: labs do not fit even at cex 0.15, there may be some overplotting
```
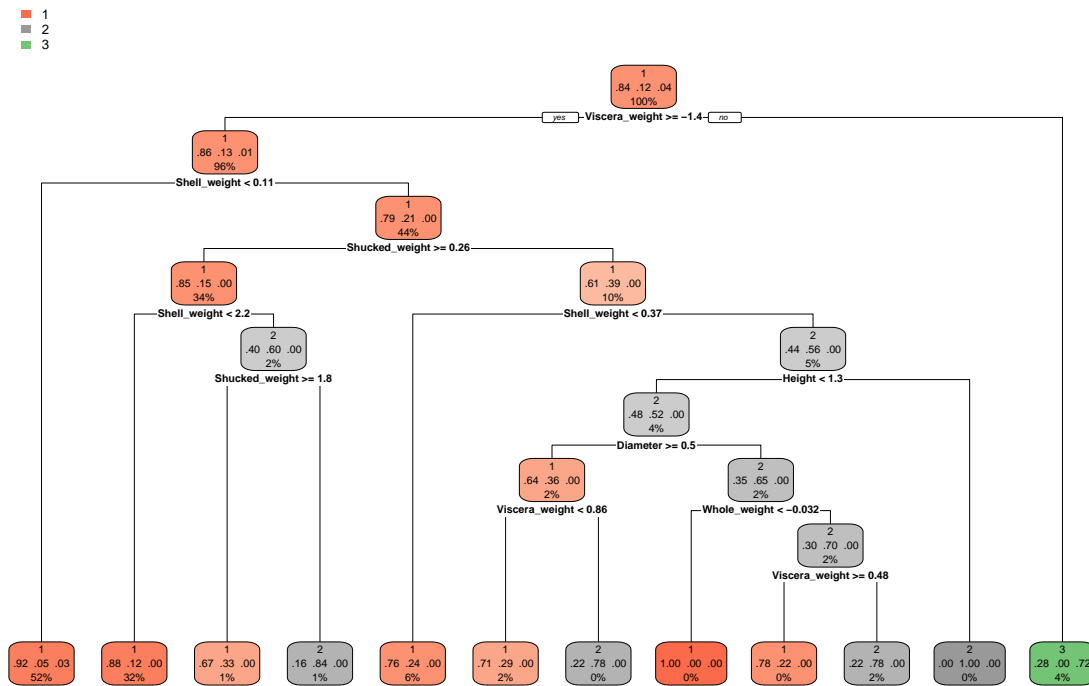
Full Tree abalone.csv

Prepruned Decision Tree abalone.csv

- ■ 1
- ■ 2
- ■ 3

```
                                    1
                                  .84 .12 .04
                                    100%
                      yes ─ Viscera_weight >= −1.4 ─ no

            1
          .86 .13 .01
            96%
      Shell_weight < 0.11

                          1
                        .79 .21 .00
                          44%
                  Shucked_weight >= 0.26

        1                                    1
      .85 .15 .00                          .61 .39 .00
        34%                                  10%
   Shell_weight < 2.2                   Shell_weight < 0.37

                    2                                        2
                  .40 .60 .00                              .44 .56 .00
                    2%                                       5%
            Shucked_weight >= 1.8                       Height < 1.3

                                                2
                                              .48 .52 .00
                                                4%
                                         Diameter >= 0.5

                                    1
                                  .64 .36 .00
                                    2%
                            Viscera_weight < 0.86
```

1	1	1	2	1	1	2	2	2	3
.92 .05 .03	.88 .12 .00	.67 .33 .00	.16 .84 .00	.76 .24 .00	.71 .29 .00	.22 .78 .00	.35 .65 .00	.00 1.00 .00	.28 .00 .72
52%	32%	1%	1%	6%	2%	0%	2%	0%	4%

27
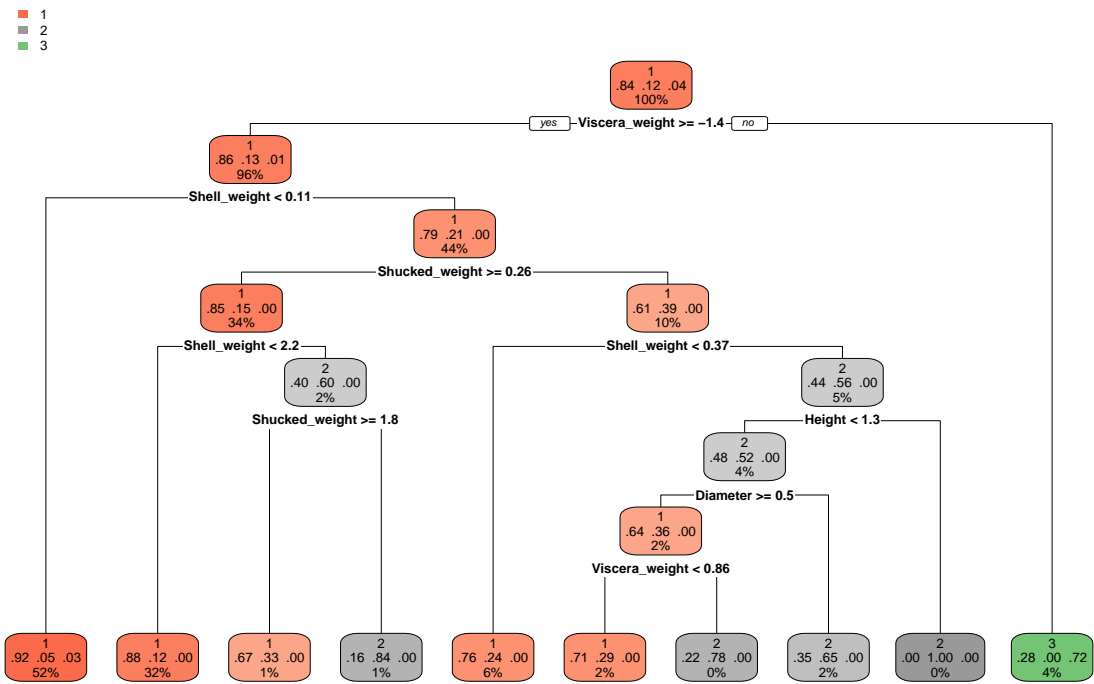
Postpruned Decision Tree abalone.csv


```
## [1] "==========    Wstępna analiza danych bazy: ========== adult.csv"
## [1] "==========    Summary: ========== adult.csv"
##       age            workclass          fnlwgt          education
##  Min.   : 1.00   Min.   :1.000   Min.   :     1   Min.   : 1.00
##  1st Qu.:12.00   1st Qu.:3.000   1st Qu.: 5026   1st Qu.:10.00
##  Median :21.00   Median :3.000   Median : 9690   Median :12.00
##  Mean   :22.44   Mean   :3.199   Mean   : 9826   Mean   :11.33
##  3rd Qu.:31.00   3rd Qu.:3.000   3rd Qu.:14522   3rd Qu.:13.00
##  Max.   :72.00   Max.   :7.000   Max.   :20263   Max.   :16.00
##  marital.status   occupation     relationship        race
##  Min.   :1.00   Min.   : 2.00   Min.   :1.000   Min.   :1.000
##  1st Qu.:3.00   1st Qu.: 4.00   1st Qu.:1.000   1st Qu.:5.000
##  Median :3.00   Median : 8.00   Median :2.000   Median :5.000
##  Mean   :3.58   Mean   : 7.96   Mean   :2.418   Mean   :4.679
##  3rd Qu.:5.00   3rd Qu.:11.00   3rd Qu.:4.000   3rd Qu.:5.000
##  Max.   :7.00   Max.   :15.00   Max.   :6.000   Max.   :5.000
##     gender        capital.gain.     capital.loss     hours.per.week
##  Min.   :1.000   Min.   :  1.000   Min.   : 1.000   Min.   : 1.00
##  1st Qu.:1.000   1st Qu.:  1.000   1st Qu.: 1.000   1st Qu.:40.00
##  Median :2.000   Median :  1.000   Median : 1.000   Median :40.00
##  Mean   :1.676   Mean   :  7.552   Mean   : 3.073   Mean   :40.87
##  3rd Qu.:2.000   3rd Qu.:  1.000   3rd Qu.: 1.000   3rd Qu.:45.00
##  Max.   :2.000   Max.   :118.000   Max.   :90.000   Max.   :94.00
##  native.country      income
##  Min.   : 1.00   Min.   :1.000
##  1st Qu.:39.00   1st Qu.:1.000
```

```
## Median :39.00   Median :1.000
## Mean   :37.38   Mean   :1.249
## 3rd Qu.:39.00   3rd Qu.:1.000
## Max.   :41.00   Max.   :2.000
## [1] "**********************************************************"
## [1] "**********************************************************"
## [1] "**********************************************************"
## [1] "==========  Structure: ========== adult.csv"
## 'data.frame':    30162 obs. of  14 variables:
## $ age           : int  23 34 22 37 12 21 33 36 15 26 ...
## $ workclass     : int  6 5 3 3 3 3 3 5 3 3 ...
## $ fnlwgt        : int  2492 2728 13189 14355 18121 16568 7983 12747 1226 7909 ...
## $ education     : int  10 10 12 2 10 13 7 12 13 10 ...
## $ marital.status: int  5 3 1 3 3 3 4 3 5 3 ...
## $ occupation    : int  2 5 7 7 11 5 9 5 11 5 ...
## $ relationship  : int  2 1 2 1 6 6 2 1 2 1 ...
## $ race          : int  5 5 5 3 3 5 3 5 5 5 ...
## $ gender        : int  2 2 2 2 1 1 1 2 1 2 ...
## $ capital.gain. : int  25 1 1 1 1 1 1 1 105 79 ...
## $ capital.loss  : int  1 1 1 1 1 1 1 1 1 1 ...
## $ hours.per.week: int  40 13 40 40 40 40 16 45 50 40 ...
## $ native.country: int  39 39 39 39 5 39 23 39 39 39 ...
## $ income        : int  1 1 1 1 1 1 1 2 2 2 ...
## NULL
## [1] "**********************************************************"
## [1] "**********************************************************"
## [1] "**********************************************************"
## [1] "**********************************************************"
## [1] "==========  Attribute data type: ========== adult.csv"
##             age       workclass          fnlwgt       education marital.status
##       "integer"       "integer"       "integer"       "integer"       "integer"
##      occupation    relationship            race          gender   capital.gain.
##       "integer"       "integer"       "integer"       "integer"       "integer"
##    capital.loss  hours.per.week  native.country          income
##       "integer"       "integer"       "integer"       "integer"
## [1] "**********************************************************"
## [1] "**********************************************************"
## [1] "**********************************************************"
## [1] "**********************************************************"
## [1] "==========  First samples: ========== adult.csv"
##   age workclass fnlwgt education marital.status occupation relationship
## 1  23         6   2492        10              5          2            2
## 2  34         5   2728        10              3          5            1
## 3  22         3  13189        12              1          7            2
## 4  37         3  14355         2              3          7            1
## 5  12         3  18121        10              3         11            6
## 6  21         3  16568        13              3          5            6
##   race gender capital.gain. capital.loss hours.per.week native.country
## 1    5      2            25            1             40             39
## 2    5      2             1            1             13             39
## 3    5      2             1            1             40             39
## 4    3      2             1            1             40             39
## 5    3      1             1            1             40              5
## 6    5      1             1            1             40             39
```

```
##    income
## 1       1
## 2       1
## 3       1
## 4       1
## 5       1
## 6       1
## [1] "*********************************************************"
## [1] "*********************************************************"
## [1] "*********************************************************"
## [1] "==========  Last samples: ========== adult.csv"
##        age workclass fnlwgt education marital.status occupation
## 30157   6         3  17376       16              5         12
## 30158  11         3  15472        8              3         14
## 30159  24         3   7556       12              3          8
## 30160  42         3   7378       12              7          2
## 30161   6         3  12061       12              5          2
## 30162  36         4  16690       12              3          5
##        relationship race gender capital.gain. capital.loss hours.per.week
## 30157            2    5      2             1            1             40
## 30158            6    5      1             1            1             38
## 30159            1    5      2             1            1             40
## 30160            5    5      1             1            1             40
## 30161            4    5      2             1            1             20
## 30162            6    5      1           108            1             40
##        native.country income
## 30157            39      1
## 30158            39      1
## 30159            39      2
## 30160            39      1
## 30161            39      1
## 30162            39      2
## [1] "*********************************************************"
## [1] "*********************************************************"
## [1] "*********************************************************"
## [1] "*********************************************************"
## [1] "==========  Dataset Dimenssions: ========== adult.csv"
## [1] 30162     14
## [1] "==========  Histogram Plot of  Decision Classes: ========== adult.csv"
```
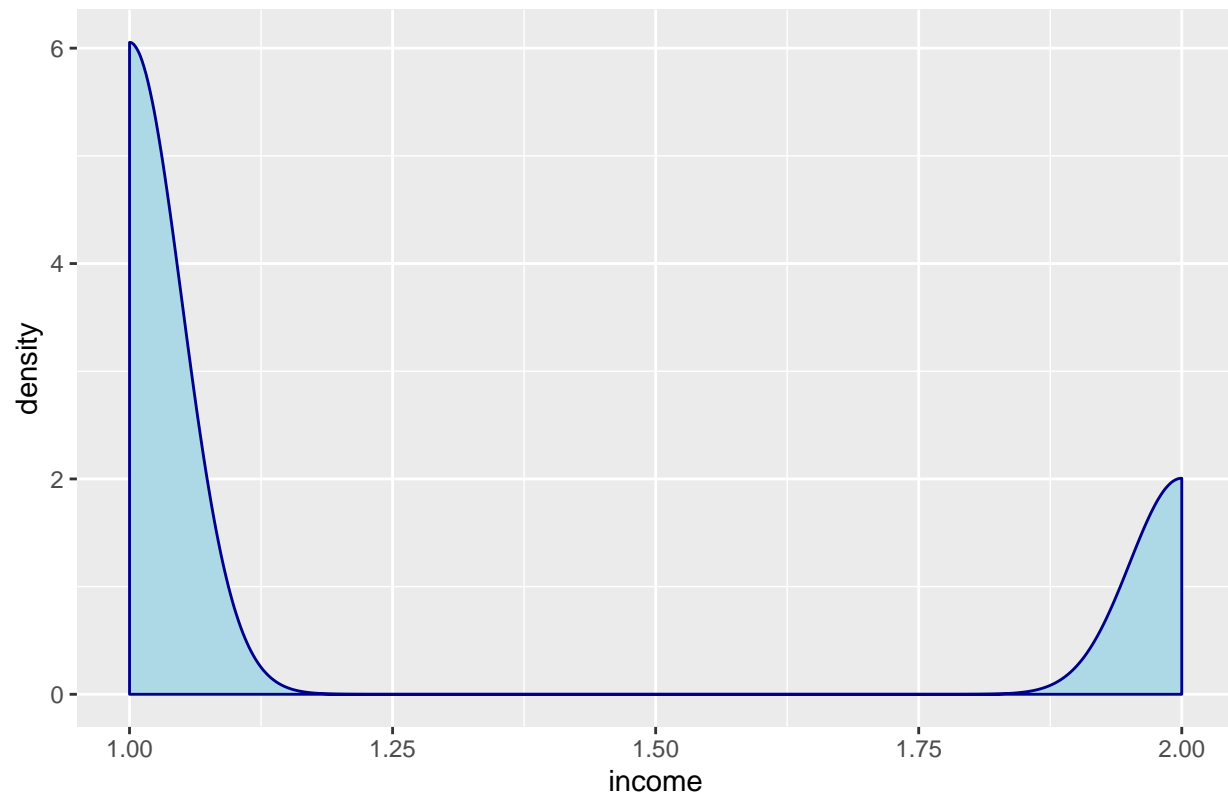
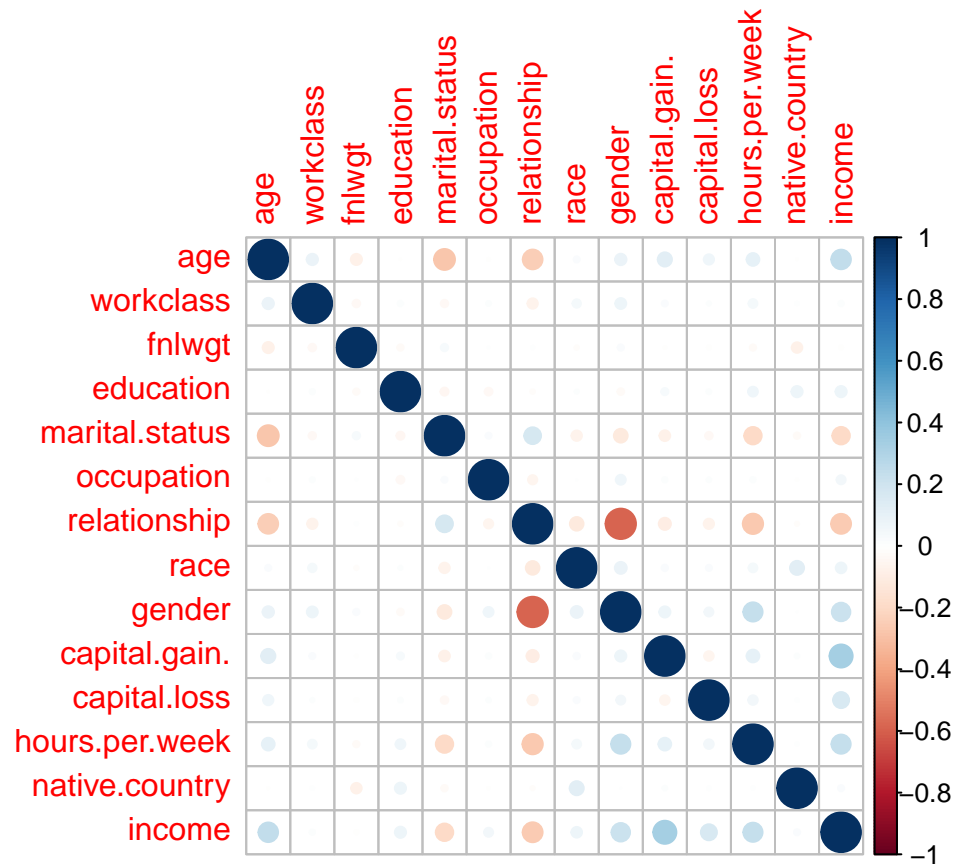## wykres atrybutu decyzji adult.csv


```
## [1] "==========  Desity Plot of  Decision Classes: ========== adult.csv"
```
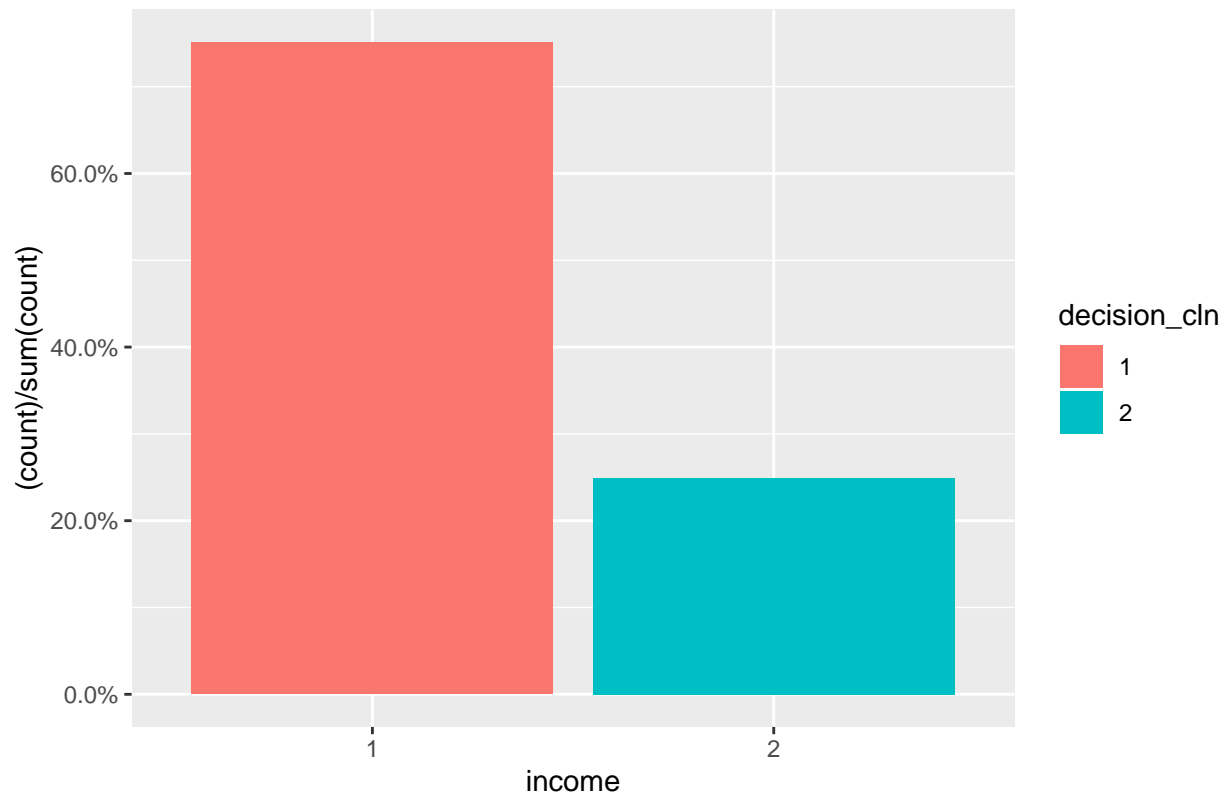
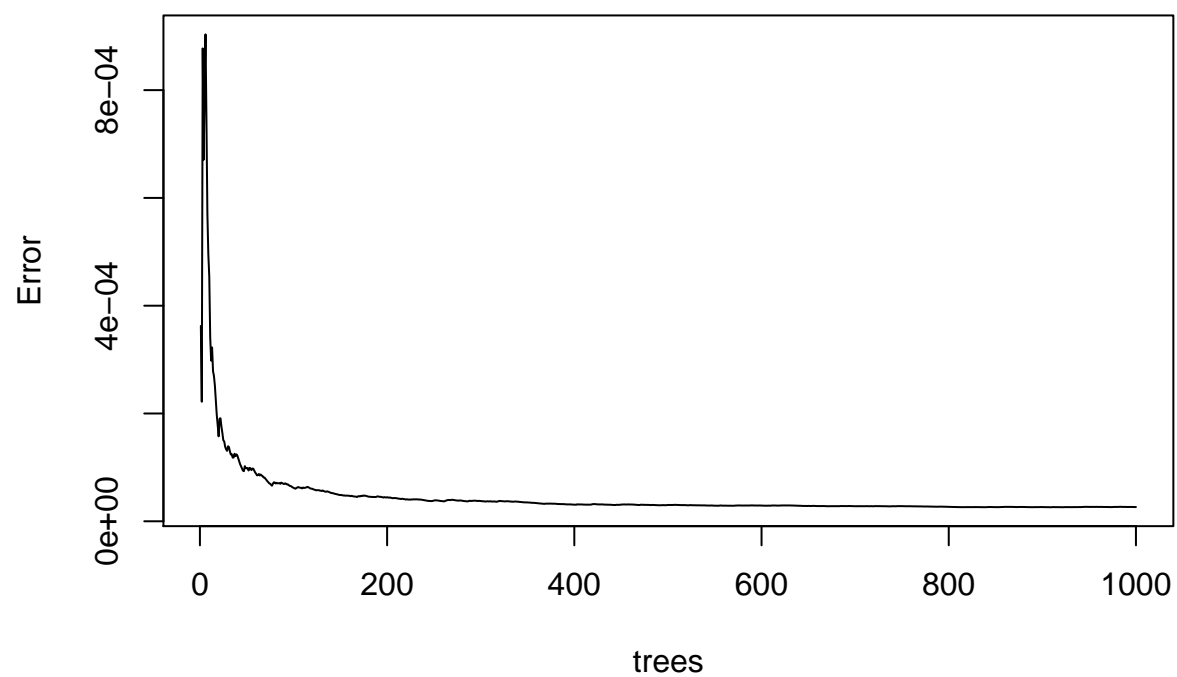## wykres atrybutu decyzji adult.csv


```
## [1] "==========  Correlation Plot of  Dataframe: ========== adult.csv"

## Warning in randomForest.default(m, y, ...): The response has five or fewer
## unique values. Are you sure you want to do regression?
```
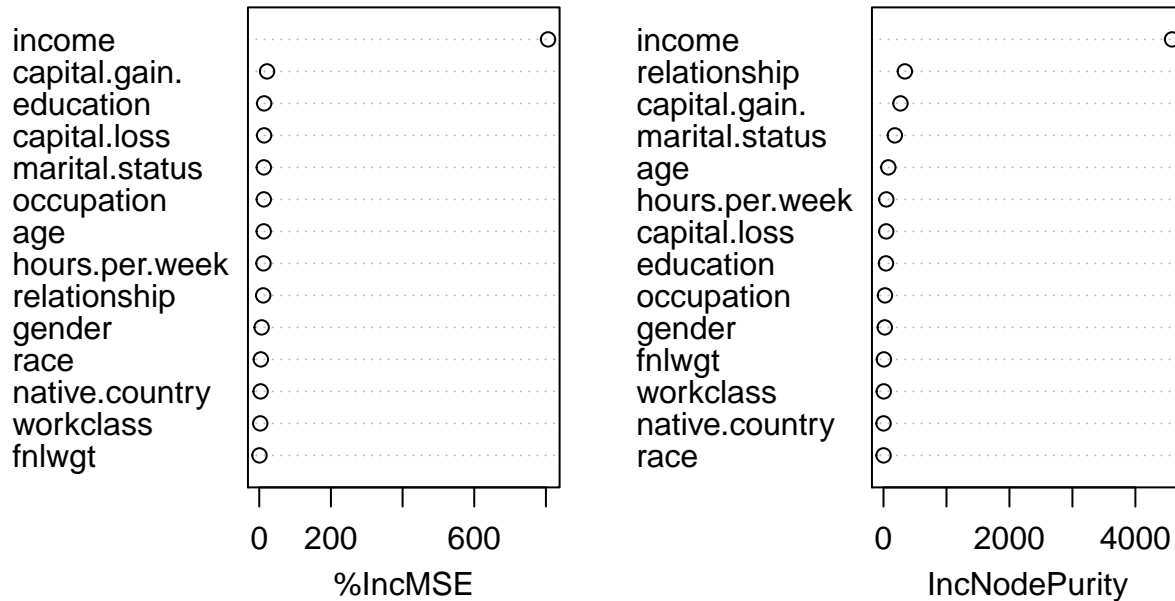
Baza adult.csv

Baza adult.csv

	%IncMSE		IncNodePurity
income	○ (high)	income	○ (high)
capital.gain.	○	relationship	○
education	○	capital.gain.	○
capital.loss	○	marital.status	○
marital.status	○	age	○
occupation	○	hours.per.week	○
age	○	capital.loss	○
hours.per.week	○	education	○
relationship	○	occupation	○
gender	○	gender	○
race	○	fnlwgt	○
native.country	○	workclass	○
workclass	○	native.country	○
fnlwgt	○	race	○

%IncMSE: 0 200 600
IncNodePurity: 0 2000 4000

```
## income ~ marital.status + relationship + capital.gain.
## [1] "Prediction matrix Base Decision tree "
##    pred_base_tr
##       1    2
##   1 5755  982
##   2  892 1420
## [1] "Prediction matrix Preprune decision tree"
##    pred_preprun_tr
##       1    2
##   1 6392  345
##   2 1149 1163
## [1] "Prediction matrix Postpruning decision tree"
##    pred_postprun_tr
##       1    2
##   1 6269  468
##   2  921 1391
## [1] "Prediction matrix Selected attribute model"
##    pred_select_attr
##       1    2
##   1 6729    8
##   2 1869  443
## income ~ marital.status + relationship + capital.gain.
## [1] "Prediction matrix Base Decision tree "
##    pred_base_tr
##       1    2
##   1 5873  940
```

```
##    2  856 1380
## [1] "Prediction matrix Preprune decision tree"
##    pred_preprun_tr
##       1    2
##   1 6491  322
##   2 1104 1132
## [1] "Prediction matrix Postpruning decision tree"
##    pred_postprun_tr
##       1    2
##   1 6312  501
##   2  844 1392
## [1] "Prediction matrix Selected attribute model"
##    pred_select_attr
##       1    2
##   1 6807    6
##   2 1830  406
## income ~ marital.status + relationship + capital.gain.
## [1] "Prediction matrix Base Decision tree "
##    pred_base_tr
##       1    2
##   1 5897  853
##   2  860 1439
## [1] "Prediction matrix Preprune decision tree"
##    pred_preprun_tr
##       1    2
##   1 6423  327
##   2 1137 1162
## [1] "Prediction matrix Postpruning decision tree"
##    pred_postprun_tr
##       1    2
##   1 6366  384
##   2  959 1340
## [1] "Prediction matrix Selected attribute model"
##    pred_select_attr
##       1    2
##   1 6744    6
##   2 1863  436
## income ~ marital.status + relationship + capital.gain.
## [1] "Prediction matrix Base Decision tree "
##    pred_base_tr
##       1    2
##   1 5872  916
##   2  848 1413
## [1] "Prediction matrix Preprune decision tree"
##    pred_preprun_tr
##       1    2
##   1 6505  283
##   2 1128 1133
## [1] "Prediction matrix Postpruning decision tree"
##    pred_postprun_tr
##       1    2
##   1 6348  440
##   2  893 1368
## [1] "Prediction matrix Selected attribute model"
```

```
##    pred_select_attr
##         1    2
##   1 6782    6
##   2 1852  409
## income ~ marital.status + relationship + capital.gain.
## [1] "Prediction matrix Base Decision tree "
##    pred_base_tr
##         1    2
##   1 5928  942
##   2  811 1368
## [1] "Prediction matrix Preprune decision tree"
##    pred_preprun_tr
##         1    2
##   1 6549  321
##   2 1095 1084
## [1] "Prediction matrix Postpruning decision tree"
##    pred_postprun_tr
##         1    2
##   1 6330  540
##   2  825 1354
## [1] "Prediction matrix Selected attribute model"
##    pred_select_attr
##         1    2
##   1 6865    5
##   2 1744  435
## income ~ marital.status + relationship + capital.gain.
## [1] "Prediction matrix Base Decision tree "
##    pred_base_tr
##         1    2
##   1 5871  948
##   2  841 1389
## [1] "Prediction matrix Preprune decision tree"
##    pred_preprun_tr
##         1    2
##   1 6463  356
##   2 1084 1146
## [1] "Prediction matrix Postpruning decision tree"
##    pred_postprun_tr
##         1    2
##   1 6308  511
##   2  869 1361
## [1] "Prediction matrix Selected attribute model"
##    pred_select_attr
##         1    2
##   1 6812    7
##   2 1803  427
## income ~ marital.status + relationship + capital.gain.
## [1] "Prediction matrix Base Decision tree "
##    pred_base_tr
##         1    2
##   1 5879  877
##   2  914 1379
## [1] "Prediction matrix Preprune decision tree"
##    pred_preprun_tr
```

```
##         1    2
##   1 6486  270
##   2 1185 1108
## [1] "Prediction matrix Postpruning decision tree"
##     pred_postprun_tr
##         1    2
##   1 6345  411
##   2  937 1356
## [1] "Prediction matrix Selected attribute model"
##     pred_select_attr
##         1    2
##   1 6750    6
##   2 1885  408
## income ~ marital.status + relationship + capital.gain.
## [1] "Prediction matrix Base Decision tree "
##     pred_base_tr
##         1    2
##   1 5809  993
##   2  808 1439
## [1] "Prediction matrix Preprune decision tree"
##     pred_preprun_tr
##         1    2
##   1 6443  359
##   2 1075 1172
## [1] "Prediction matrix Postpruning decision tree"
##     pred_postprun_tr
##         1    2
##   1 6317  485
##   2  840 1407
## [1] "Prediction matrix Selected attribute model"
##     pred_select_attr
##         1    2
##   1 6800    2
##   2 1805  442
## income ~ marital.status + relationship + capital.gain.
## [1] "Prediction matrix Base Decision tree "
##     pred_base_tr
##         1    2
##   1 5893  900
##   2  864 1392
## [1] "Prediction matrix Preprune decision tree"
##     pred_preprun_tr
##         1    2
##   1 6460  333
##   2 1114 1142
## [1] "Prediction matrix Postpruning decision tree"
##     pred_postprun_tr
##         1    2
##   1 6336  457
##   2  886 1370
## [1] "Prediction matrix Selected attribute model"
##     pred_select_attr
##         1    2
##   1 6789    4
```

```
##    2 1838  418
## income ~ marital.status + relationship + capital.gain.
## [1] "Prediction matrix Base Decision tree "
##    pred_base_tr
##        1    2
##   1 5919  908
##   2  874 1348
## [1] "Prediction matrix Preprune decision tree"
##    pred_preprun_tr
##        1    2
##   1 6575  252
##   2 1154 1068
## [1] "Prediction matrix Postpruning decision tree"
##    pred_postprun_tr
##        1    2
##   1 6408  419
##   2  892 1330
## [1] "Prediction matrix Selected attribute model"
##    pred_select_attr
##        1    2
##   1 6823    4
##   2 1817  405
## income ~ marital.status + relationship + capital.gain.
## [1] "Prediction matrix Base Decision tree "
##    pred_base_tr
##        1    2
##   1 5909  902
##   2  854 1384
## [1] "Prediction matrix Preprune decision tree"
##    pred_preprun_tr
##        1    2
##   1 6532  279
##   2 1128 1110
## [1] "Prediction matrix Postpruning decision tree"
##    pred_postprun_tr
##        1    2
##   1 6443  368
##   2  958 1280
## [1] "Prediction matrix Selected attribute model"
##    pred_select_attr
##        1    2
##   1 6807    4
##   2 1816  422
## income ~ marital.status + relationship + capital.gain.
## [1] "Prediction matrix Base Decision tree "
##    pred_base_tr
##        1    2
##   1 5861  958
##   2  819 1411
## [1] "Prediction matrix Preprune decision tree"
##    pred_preprun_tr
##        1    2
##   1 6536  283
##   2 1146 1084
```

```
## [1] "Prediction matrix Postpruning decision tree"
##    pred_postprun_tr
##         1    2
##   1 6445  374
##   2  940 1290
## [1] "Prediction matrix Selected attribute model"
##    pred_select_attr
##         1    2
##   1 6815    4
##   2 1799  431
## income ~ marital.status + relationship + capital.gain.
## [1] "Prediction matrix Base Decision tree "
##    pred_base_tr
##         1    2
##   1 5933  870
##   2  854 1392
## [1] "Prediction matrix Preprune decision tree"
##    pred_preprun_tr
##         1    2
##   1 6477  326
##   2 1112 1134
## [1] "Prediction matrix Postpruning decision tree"
##    pred_postprun_tr
##         1    2
##   1 6357  446
##   2  901 1345
## [1] "Prediction matrix Selected attribute model"
##    pred_select_attr
##         1    2
##   1 6798    5
##   2 1819  427
## income ~ marital.status + relationship + capital.gain.
## [1] "Prediction matrix Base Decision tree "
##    pred_base_tr
##         1    2
##   1 5881  903
##   2  907 1358
## [1] "Prediction matrix Preprune decision tree"
##    pred_preprun_tr
##         1    2
##   1 6419  365
##   2 1135 1130
## [1] "Prediction matrix Postpruning decision tree"
##    pred_postprun_tr
##         1    2
##   1 6277  507
##   2  861 1404
## [1] "Prediction matrix Selected attribute model"
##    pred_select_attr
##         1    2
##   1 6776    8
##   2 1884  381
## income ~ marital.status + relationship + capital.gain.
## [1] "Prediction matrix Base Decision tree "
```

```
##      pred_base_tr
##         1    2
##   1 5873  929
##   2  827 1420
## [1] "Prediction matrix Preprune decision tree"
##      pred_preprun_tr
##         1    2
##   1 6471  331
##   2 1115 1132
## [1] "Prediction matrix Postpruning decision tree"
##      pred_postprun_tr
##         1    2
##   1 6332  470
##   2  884 1363
## [1] "Prediction matrix Selected attribute model"
##      pred_select_attr
##         1    2
##   1 6794    8
##   2 1809  438
## income ~ marital.status + relationship + capital.gain.
## [1] "Prediction matrix Base Decision tree "
##      pred_base_tr
##         1    2
##   1 5904  954
##   2  835 1356
## [1] "Prediction matrix Preprune decision tree"
##      pred_preprun_tr
##         1    2
##   1 6529  329
##   2 1081 1110
## [1] "Prediction matrix Postpruning decision tree"
##      pred_postprun_tr
##         1    2
##   1 6435  423
##   2  850 1341
## [1] "Prediction matrix Selected attribute model"
##      pred_select_attr
##         1    2
##   1 6850    8
##   2 1795  396
## income ~ marital.status + relationship + capital.gain.
## [1] "Prediction matrix Base Decision tree "
##      pred_base_tr
##         1    2
##   1 5854  902
##   2  936 1357
## [1] "Prediction matrix Preprune decision tree"
##      pred_preprun_tr
##         1    2
##   1 6388  368
##   2 1139 1154
## [1] "Prediction matrix Postpruning decision tree"
##      pred_postprun_tr
##         1    2
```

```
##   1 6328  428
##   2  941 1352
## [1] "Prediction matrix Selected attribute model"
##    pred_select_attr
##        1    2
##   1 6751    5
##   2 1872  421
## income ~ marital.status + relationship + capital.gain.
## [1] "Prediction matrix Base Decision tree "
##    pred_base_tr
##        1    2
##   1 5907  902
##   2  867 1373
## [1] "Prediction matrix Preprune decision tree"
##    pred_preprun_tr
##        1    2
##   1 6461  348
##   2 1118 1122
## [1] "Prediction matrix Postpruning decision tree"
##    pred_postprun_tr
##        1    2
##   1 6376  433
##   2  919 1321
## [1] "Prediction matrix Selected attribute model"
##    pred_select_attr
##        1    2
##   1 6796   13
##   2 1808  432
## income ~ marital.status + relationship + capital.gain.
## [1] "Prediction matrix Base Decision tree "
##    pred_base_tr
##        1    2
##   1 5899  872
##   2  894 1384
## [1] "Prediction matrix Preprune decision tree"
##    pred_preprun_tr
##        1    2
##   1 6427  344
##   2 1154 1124
## [1] "Prediction matrix Postpruning decision tree"
##    pred_postprun_tr
##        1    2
##   1 6369  402
##   2  976 1302
## [1] "Prediction matrix Selected attribute model"
##    pred_select_attr
##        1    2
##   1 6767    4
##   2 1859  419
## income ~ marital.status + relationship + capital.gain.
## [1] "Prediction matrix Base Decision tree "
##    pred_base_tr
##        1    2
##   1 5871  934
```

```
##    2  889 1355
## [1] "Prediction matrix Preprune decision tree"
##    pred_preprun_tr
##        1    2
##   1 6445  360
##   2 1114 1130
## [1] "Prediction matrix Postpruning decision tree"
##    pred_postprun_tr
##        1    2
##   1 6371  434
##   2  918 1326
## [1] "Prediction matrix Selected attribute model"
##    pred_select_attr
##        1    2
##   1 6797    8
##   2 1826  418
## income ~ marital.status + relationship + capital.gain.
## [1] "Prediction matrix Base Decision tree "
##    pred_base_tr
##        1    2
##   1 5906  928
##   2  849 1366
## [1] "Prediction matrix Preprune decision tree"
##    pred_preprun_tr
##        1    2
##   1 6485  349
##   2 1117 1098
## [1] "Prediction matrix Postpruning decision tree"
##    pred_postprun_tr
##        1    2
##   1 6367  467
##   2  877 1338
## [1] "Prediction matrix Selected attribute model"
##    pred_select_attr
##        1    2
##   1 6823   11
##   2 1783  432
## income ~ marital.status + relationship + capital.gain.
## [1] "Prediction matrix Base Decision tree "
##    pred_base_tr
##        1    2
##   1 5894  862
##   2  868 1425
## [1] "Prediction matrix Preprune decision tree"
##    pred_preprun_tr
##        1    2
##   1 6474  282
##   2 1142 1151
## [1] "Prediction matrix Postpruning decision tree"
##    pred_postprun_tr
##        1    2
##   1 6459  297
##   2  989 1304
## [1] "Prediction matrix Selected attribute model"
```

```
##    pred_select_attr
##        1    2
##   1 6751    5
##   2 1857  436
## income ~ marital.status + relationship + capital.gain.
## [1] "Prediction matrix Base Decision tree "
##    pred_base_tr
##        1    2
##   1 5811  942
##   2  897 1399
## [1] "Prediction matrix Preprune decision tree"
##    pred_preprun_tr
##        1    2
##   1 6458  295
##   2 1175 1121
## [1] "Prediction matrix Postpruning decision tree"
##    pred_postprun_tr
##        1    2
##   1 6330  423
##   2  950 1346
## [1] "Prediction matrix Selected attribute model"
##    pred_select_attr
##        1    2
##   1 6747    6
##   2 1865  431
## income ~ marital.status + relationship + capital.gain.
## [1] "Prediction matrix Base Decision tree "
##    pred_base_tr
##        1    2
##   1 5982  873
##   2  834 1360
## [1] "Prediction matrix Preprune decision tree"
##    pred_preprun_tr
##        1    2
##   1 6517  338
##   2 1106 1088
## [1] "Prediction matrix Postpruning decision tree"
##    pred_postprun_tr
##        1    2
##   1 6427  428
##   2  921 1273
## [1] "Prediction matrix Selected attribute model"
##    pred_select_attr
##        1    2
##   1 6849    6
##   2 1802  392
## income ~ marital.status + relationship + capital.gain.
## [1] "Prediction matrix Base Decision tree "
##    pred_base_tr
##        1    2
##   1 5888  958
##   2  871 1332
## [1] "Prediction matrix Preprune decision tree"
##    pred_preprun_tr
```

```
##         1     2
##   1 6476   370
##   2 1102  1101
## [1] "Prediction matrix Postpruning decision tree"
##     pred_postprun_tr
##         1     2
##   1 6420   426
##   2  919  1284
## [1] "Prediction matrix Selected attribute model"
##     pred_select_attr
##         1     2
##   1 6836    10
##   2 1823   380
## income ~ marital.status + relationship + capital.gain.
## [1] "Prediction matrix Base Decision tree "
##     pred_base_tr
##         1     2
##   1 5835   911
##   2  873  1430
## [1] "Prediction matrix Preprune decision tree"
##     pred_preprun_tr
##         1     2
##   1 6409   337
##   2 1152  1151
## [1] "Prediction matrix Postpruning decision tree"
##     pred_postprun_tr
##         1     2
##   1 6297   449
##   2  952  1351
## [1] "Prediction matrix Selected attribute model"
##     pred_select_attr
##         1     2
##   1 6737     9
##   2 1896   407
## income ~ marital.status + relationship + capital.gain.
## [1] "Prediction matrix Base Decision tree "
##     pred_base_tr
##         1     2
##   1 5823   972
##   2  824  1430
## [1] "Prediction matrix Preprune decision tree"
##     pred_preprun_tr
##         1     2
##   1 6472   323
##   2 1119  1135
## [1] "Prediction matrix Postpruning decision tree"
##     pred_postprun_tr
##         1     2
##   1 6326   469
##   2  883  1371
## [1] "Prediction matrix Selected attribute model"
##     pred_select_attr
##         1     2
##   1 6789     6
```

```
##   2 1847  407
## income ~ marital.status + relationship + capital.gain.
## [1] "Prediction matrix Base Decision tree "
##     pred_base_tr
##         1    2
##   1 5925  866
##   2  866 1392
## [1] "Prediction matrix Preprune decision tree"
##     pred_preprun_tr
##         1    2
##   1 6443  348
##   2 1120 1138
## [1] "Prediction matrix Postpruning decision tree"
##     pred_postprun_tr
##         1    2
##   1 6398  393
##   2  966 1292
## [1] "Prediction matrix Selected attribute model"
##     pred_select_attr
##         1    2
##   1 6783    8
##   2 1842  416
## income ~ marital.status + relationship + capital.gain.
## [1] "Prediction matrix Base Decision tree "
##     pred_base_tr
##         1    2
##   1 5878  941
##   2  886 1344
## [1] "Prediction matrix Preprune decision tree"
##     pred_preprun_tr
##         1    2
##   1 6521  298
##   2 1173 1057
## [1] "Prediction matrix Postpruning decision tree"
##     pred_postprun_tr
##         1    2
##   1 6379  440
##   2  913 1317
## [1] "Prediction matrix Selected attribute model"
##     pred_select_attr
##         1    2
##   1 6810    9
##   2 1815  415
## income ~ marital.status + relationship + capital.gain.
## [1] "Prediction matrix Base Decision tree "
##     pred_base_tr
##         1    2
##   1 5856  885
##   2  862 1446
## [1] "Prediction matrix Preprune decision tree"
##     pred_preprun_tr
##         1    2
##   1 6403  338
##   2 1146 1162
```
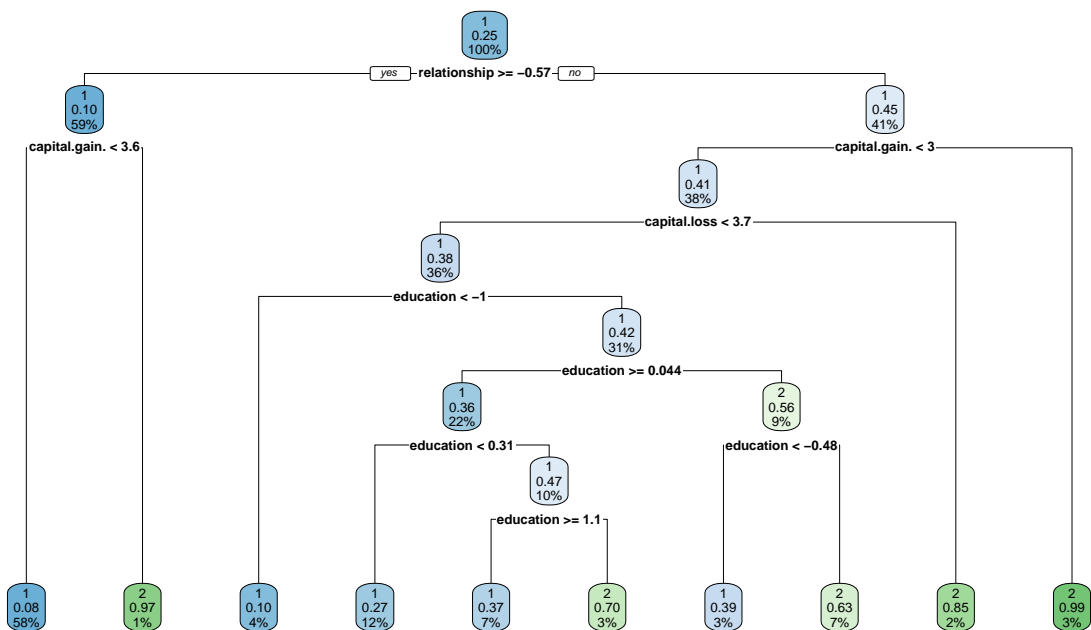
```
## [1] "Prediction matrix Postpruning decision tree"
##    pred_postprun_tr
##        1    2
##   1 6356  385
##   2  969 1339
## [1] "Prediction matrix Selected attribute model"
##    pred_select_attr
##        1    2
##   1 6732    9
##   2 1868  440


## Warning: labs do not fit even at cex 0.15, there may be some overplotting
```
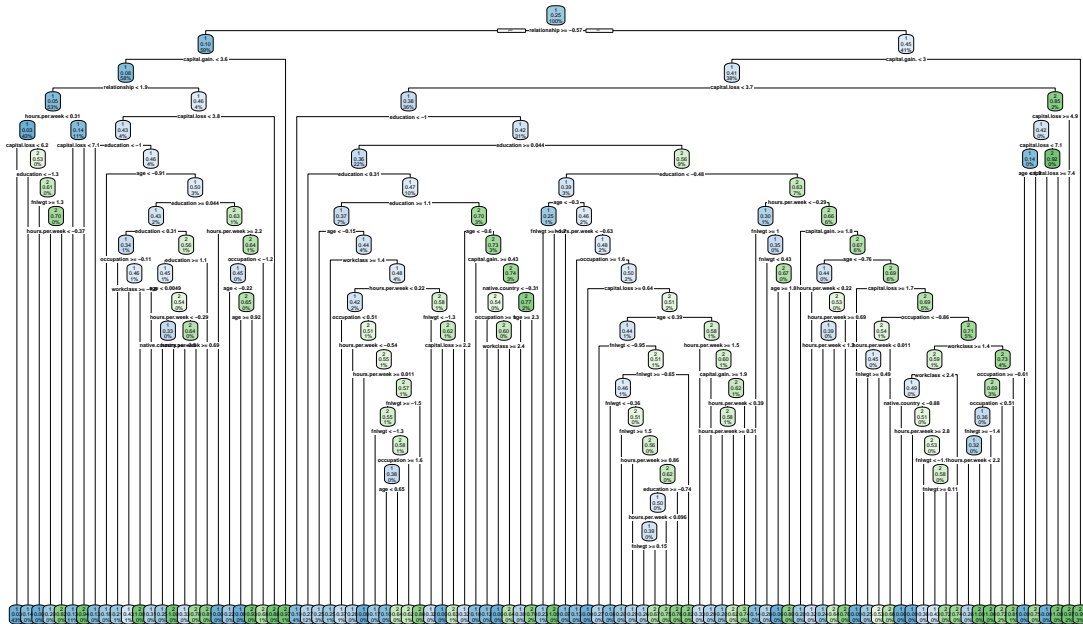
Full Tree adult.csv
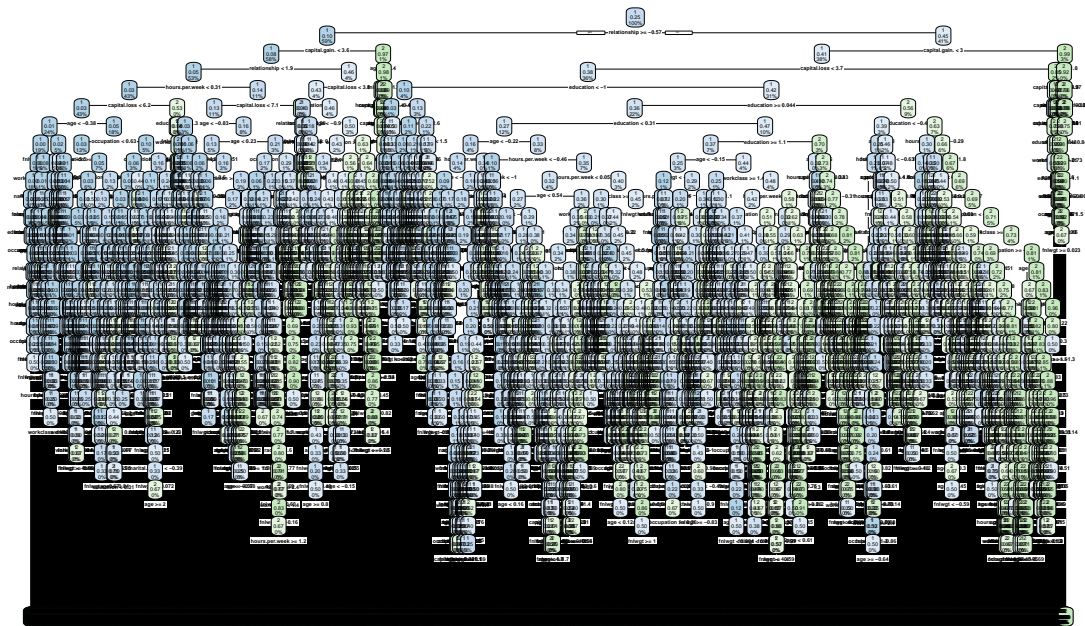
Prepruned Decision Tree adult.csv


```
## Warning: labs do not fit even at cex 0.15, there may be some overplotting
```

Postpruned Decision Tree adult.csv


```
## [1] "==========  Wstępna analiza danych bazy: ========== bank.csv"
## [1] "==========  Summary: ========== bank.csv"
##      age              job            marital          education
##  Min.   :19.00   Min.   : 1.000   Min.   :1.000   Min.   :1.000
##  1st Qu.:33.00   1st Qu.: 2.000   1st Qu.:2.000   1st Qu.:2.000
##  Median :39.00   Median : 5.000   Median :2.000   Median :2.000
##  Mean   :41.17   Mean   : 5.411   Mean   :2.148   Mean   :2.231
##  3rd Qu.:49.00   3rd Qu.: 8.000   3rd Qu.:3.000   3rd Qu.:3.000
##  Max.   :87.00   Max.   :12.000   Max.   :3.000   Max.   :4.000
##    default          balance         housing           loan
##  Min.   :1.000   Min.   :-3313   Min.   :1.000   Min.   :1.000
##  1st Qu.:1.000   1st Qu.:   69   1st Qu.:1.000   1st Qu.:1.000
##  Median :1.000   Median :  444   Median :2.000   Median :1.000
##  Mean   :1.017   Mean   : 1423   Mean   :1.566   Mean   :1.153
##  3rd Qu.:1.000   3rd Qu.: 1480   3rd Qu.:2.000   3rd Qu.:1.000
##  Max.   :2.000   Max.   :71188   Max.   :2.000   Max.   :2.000
##    contact           day            month           duration
##  Min.   :1.000   Min.   : 1.00   Min.   : 1.00   Min.   :   4
##  1st Qu.:1.000   1st Qu.: 9.00   1st Qu.: 4.00   1st Qu.: 104
##  Median :1.000   Median :16.00   Median : 7.00   Median : 185
##  Mean   :1.652   Mean   :15.92   Mean   : 6.54   Mean   : 264
##  3rd Qu.:3.000   3rd Qu.:21.00   3rd Qu.: 9.00   3rd Qu.: 329
##  Max.   :3.000   Max.   :31.00   Max.   :12.00   Max.   :3025
##    campaign          pdays           previous          poutcome
##  Min.   : 1.000   Min.   : -1.00   Min.   : 0.0000   Min.   :1.000
##  1st Qu.: 1.000   1st Qu.: -1.00   1st Qu.: 0.0000   1st Qu.:4.000
```

```
##  Median : 2.000   Median : -1.00   Median : 0.0000   Median :4.000
##  Mean   : 2.794   Mean   : 39.77   Mean   : 0.5426   Mean   :3.559
##  3rd Qu.: 3.000   3rd Qu.: -1.00   3rd Qu.: 0.0000   3rd Qu.:4.000
##  Max.   :50.000   Max.   :871.00   Max.   :25.0000   Max.   :4.000
##        y
##  Min.   :1.000
##  1st Qu.:1.000
##  Median :1.000
##  Mean   :1.115
##  3rd Qu.:1.000
##  Max.   :2.000
## [1] "**********************************************************"
## [1] "**********************************************************"
## [1] "**********************************************************"
## [1] "==========   Structure: ========== bank.csv"
## 'data.frame':    4521 obs. of  17 variables:
##  $ age      : int  30 33 35 30 59 35 36 39 41 43 ...
##  $ job      : int  11 8 5 5 2 5 7 10 3 8 ...
##  $ marital  : int  2 2 3 2 2 3 2 2 2 2 ...
##  $ education: int  1 2 3 3 2 3 3 2 3 1 ...
##  $ default  : int  1 1 1 1 1 1 1 1 1 1 ...
##  $ balance  : int  1787 4789 1350 1476 0 747 307 147 221 -88 ...
##  $ housing  : int  1 2 2 2 2 1 2 2 2 2 ...
##  $ loan     : int  1 2 1 2 1 1 1 1 1 2 ...
##  $ contact  : int  1 1 1 3 3 1 1 1 3 1 ...
##  $ day      : int  19 11 16 3 5 23 14 6 14 17 ...
##  $ month    : int  11 9 1 7 9 4 9 9 9 1 ...
##  $ duration : int  79 220 185 199 226 141 341 151 57 313 ...
##  $ campaign : int  1 1 1 4 1 2 1 2 2 1 ...
##  $ pdays    : int  -1 339 330 -1 -1 176 330 -1 -1 147 ...
##  $ previous : int  0 4 1 0 0 3 2 0 0 2 ...
##  $ poutcome : int  4 1 1 4 4 1 2 4 4 1 ...
##  $ y        : int  1 1 1 1 1 1 1 1 1 1 ...
## NULL
## [1] "**********************************************************"
## [1] "**********************************************************"
## [1] "**********************************************************"
## [1] "**********************************************************"
## [1] "==========   Attribute data type: ========== bank.csv"
##       age       job   marital education   default   balance   housing
## "integer" "integer" "integer" "integer" "integer" "integer" "integer"
##      loan   contact       day     month  duration  campaign     pdays
## "integer" "integer" "integer" "integer" "integer" "integer" "integer"
##  previous  poutcome         y
## "integer" "integer" "integer"
## [1] "**********************************************************"
## [1] "**********************************************************"
## [1] "**********************************************************"
## [1] "**********************************************************"
## [1] "==========   First samples: ========== bank.csv"
##   age job marital education default balance housing loan contact day month
## 1  30  11       2         1       1    1787       1    1       1  19    11
## 2  33   8       2         2       1    4789       2    2       1  11     9
## 3  35   5       3         3       1    1350       2    1       1  16     1
```

```
## 4   30   5         2            3        1     1476        2     2         3    3      7
## 5   59   2         2            2        1        0        2     1         3    5      9
## 6   35   5         3            3        1      747        1     1         1   23      4
##    duration campaign pdays previous poutcome y
## 1        79        1    -1        0        4 1
## 2       220        1   339        4        1 1
## 3       185        1   330        1        1 1
## 4       199        4    -1        0        4 1
## 5       226        1    -1        0        4 1
## 6       141        2   176        3        1 1
## [1] "***********************************************************"
## [1] "***********************************************************"
## [1] "***********************************************************"
## [1] "==========  Last samples: ========== bank.csv"
##       age job marital education default balance housing loan contact day
## 4516   32   8       3         2       1     473       2    1       1   7
## 4517   33   8       2         2       1    -333       2    1       1  30
## 4518   57   7       2         3       2   -3313       2    2       3   9
## 4519   57  10       2         2       1     295       1    1       1  19
## 4520   28   2       2         2       1    1137       1    1       1   6
## 4521   44   3       3         3       1    1136       2    2       1   3
##       month duration campaign pdays previous poutcome y
## 4516      6      624        5    -1        0        4 1
## 4517      6      329        5    -1        0        4 1
## 4518      9      153        1    -1        0        4 1
## 4519      2      151       11    -1        0        4 1
## 4520      4      129        4   211        3        2 1
## 4521      1      345        2   249        7        2 1
## [1] "***********************************************************"
## [1] "***********************************************************"
## [1] "***********************************************************"
## [1] "***********************************************************"
## [1] "==========  Dataset Dimenssions: ========== bank.csv"
## [1] 4521   17
## [1] "==========  Histogram Plot of  Decision Classes: ========== bank.csv"
```
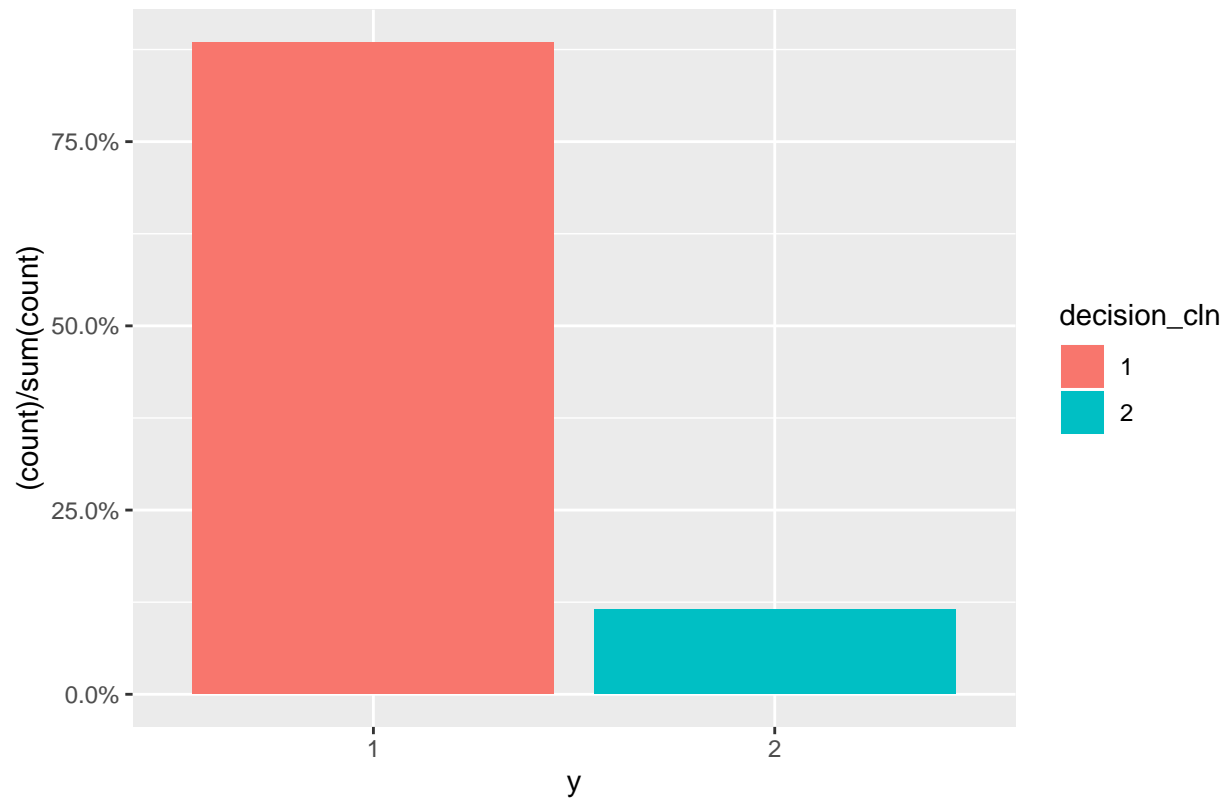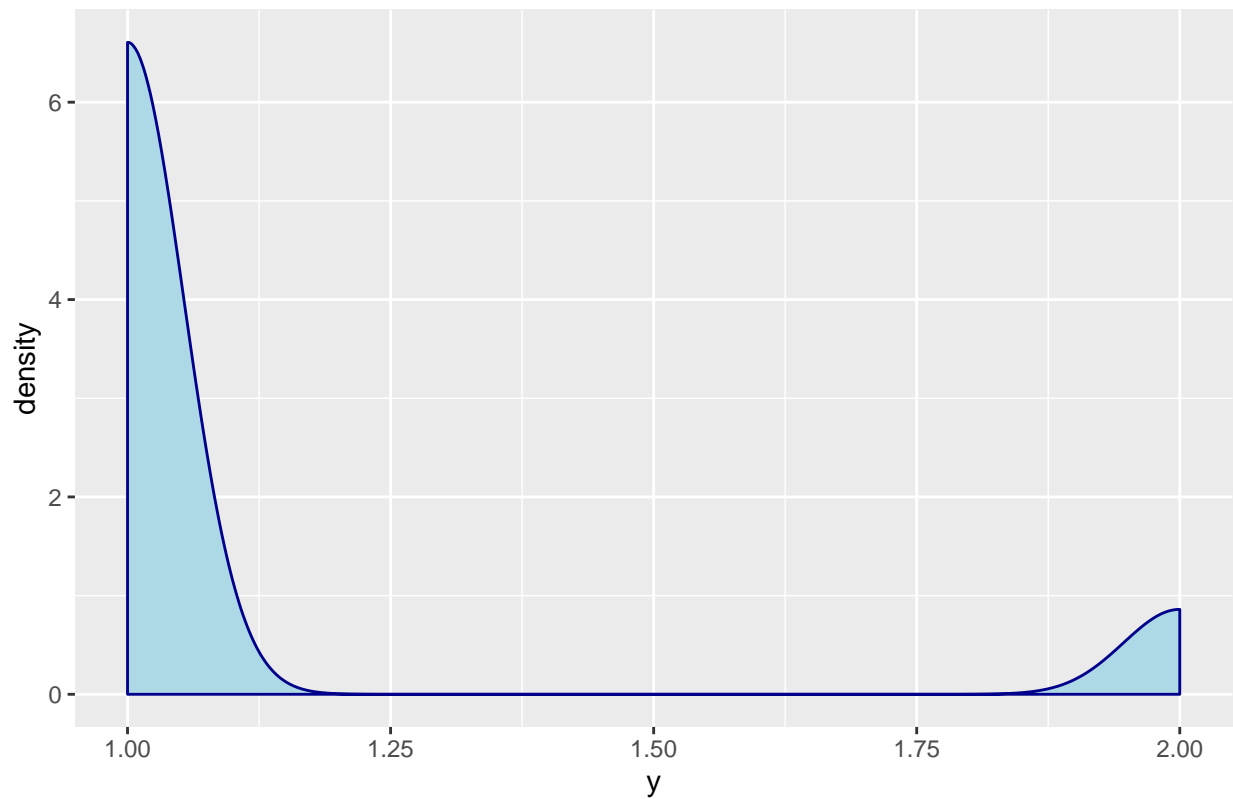
wykres atrybutu decyzji bank.csv


```
## [1] "=========  Desity Plot of  Decision Classes: ========= bank.csv"
```
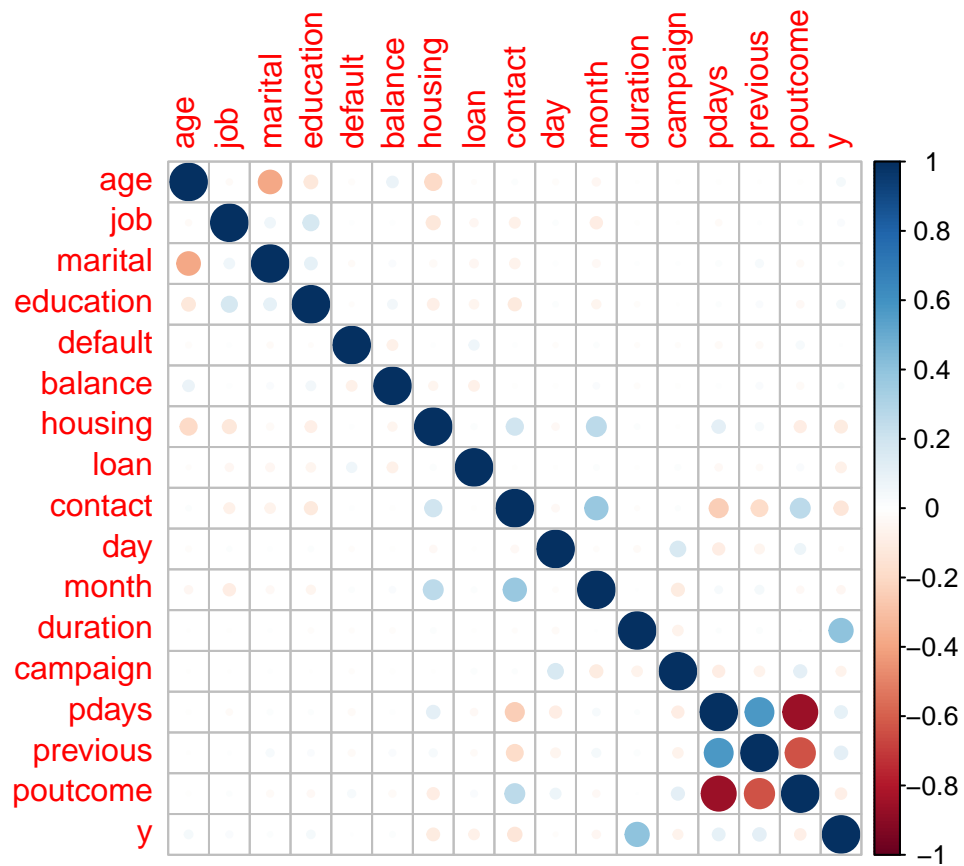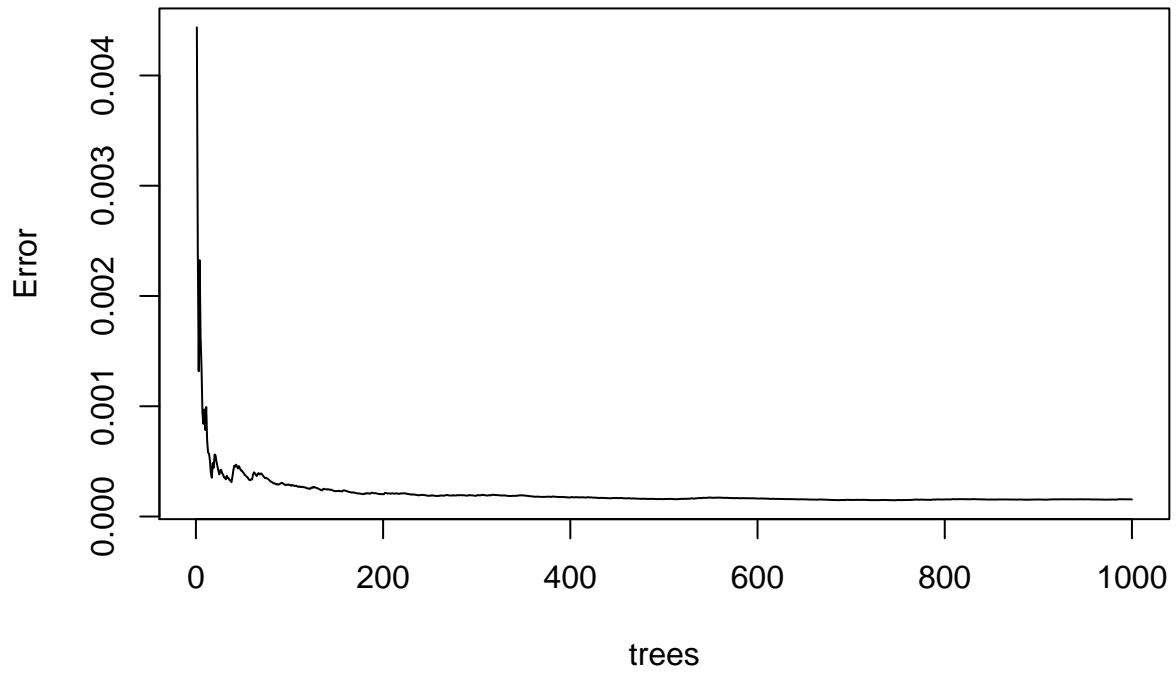
wykres atrybutu decyzji bank.csv


```
## [1] "==========  Correlation Plot of  Dataframe: ========== bank.csv"

## Warning in randomForest.default(m, y, ...): The response has five or fewer
## unique values. Are you sure you want to do regression?
```
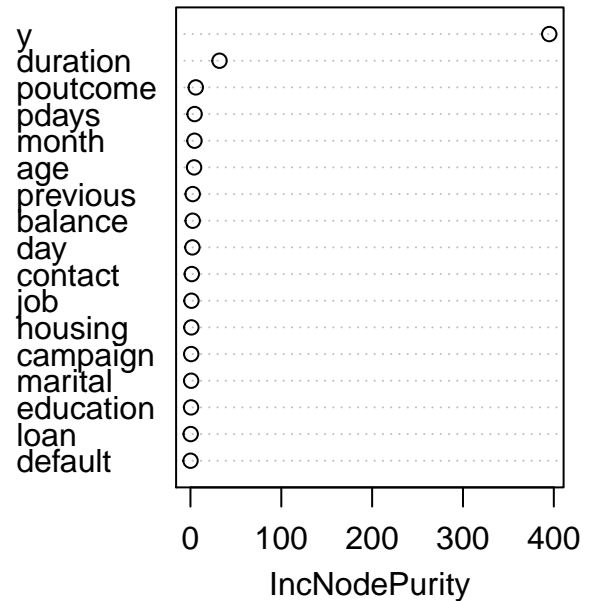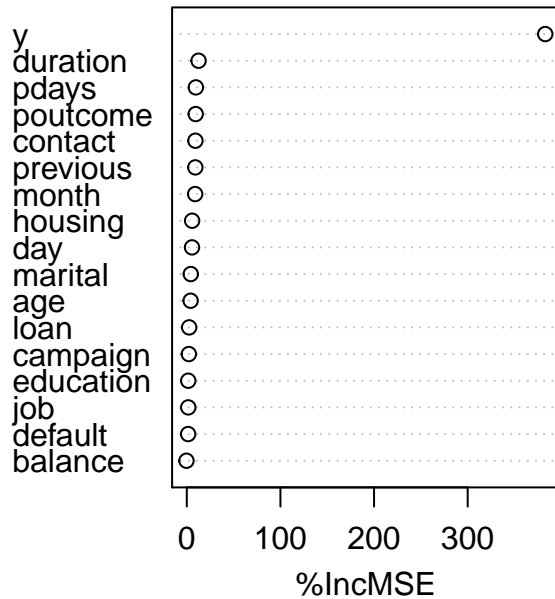
Baza bank.csv

Baza bank.csv


```
## y ~ month + duration + pdays + poutcome
## [1] "Prediction matrix Base Decision tree "
##    pred_base_tr
##        1    2
##   1 1091  103
##   2   95   68
## [1] "Prediction matrix Preprune decision tree"
##    pred_preprun_tr
##        1    2
##   1 1148   46
##   2  102   61
## [1] "Prediction matrix Postpruning decision tree"
##    pred_postprun_tr
##        1    2
##   1 1148   46
##   2  102   61
## [1] "Prediction matrix Selected attribute model"
##    pred_select_attr
##        1    2
##   1 1146   48
##   2  101   62
## y ~ month + duration + pdays + poutcome
## [1] "Prediction matrix Base Decision tree "
##    pred_base_tr
##        1    2
##   1 1109  100
```

```
##  2   97   51
## [1] "Prediction matrix Preprune decision tree"
##    pred_preprun_tr
##         1    2
##   1 1173   36
##   2  110   38
## [1] "Prediction matrix Postpruning decision tree"
##    pred_postprun_tr
##         1    2
##   1 1170   39
##   2  105   43
## [1] "Prediction matrix Selected attribute model"
##    pred_select_attr
##         1    2
##   1 1176   33
##   2  101   47
## y ~ month + duration + pdays + poutcome
## [1] "Prediction matrix Base Decision tree "
##    pred_base_tr
##         1    2
##   1 1097  112
##   2   92   56
## [1] "Prediction matrix Preprune decision tree"
##    pred_preprun_tr
##         1    2
##   1 1167   42
##   2   98   50
## [1] "Prediction matrix Postpruning decision tree"
##    pred_postprun_tr
##         1    2
##   1 1160   49
##   2   91   57
## [1] "Prediction matrix Selected attribute model"
##    pred_select_attr
##         1    2
##   1 1167   42
##   2   94   54
## y ~ month + duration + pdays + poutcome
## [1] "Prediction matrix Base Decision tree "
##    pred_base_tr
##         1    2
##   1 1100   92
##   2   92   73
## [1] "Prediction matrix Preprune decision tree"
##    pred_preprun_tr
##         1    2
##   1 1145   47
##   2  106   59
## [1] "Prediction matrix Postpruning decision tree"
##    pred_postprun_tr
##         1    2
##   1 1148   44
##   2  106   59
## [1] "Prediction matrix Selected attribute model"
```

```
##    pred_select_attr
##        1    2
##  1 1140   52
##  2  102   63
## y ~ month + duration + pdays + poutcome
## [1] "Prediction matrix Base Decision tree "
##    pred_base_tr
##        1    2
##  1 1100   93
##  2   93   71
## [1] "Prediction matrix Preprune decision tree"
##    pred_preprun_tr
##        1    2
##  1 1155   38
##  2  110   54
## [1] "Prediction matrix Postpruning decision tree"
##    pred_postprun_tr
##        1    2
##  1 1140   53
##  2   95   69
## [1] "Prediction matrix Selected attribute model"
##    pred_select_attr
##        1    2
##  1 1165   28
##  2  109   55
## y ~ month + duration + pdays + poutcome
## [1] "Prediction matrix Base Decision tree "
##    pred_base_tr
##        1    2
##  1 1108  102
##  2   84   63
## [1] "Prediction matrix Preprune decision tree"
##    pred_preprun_tr
##        1    2
##  1 1186   24
##  2  102   45
## [1] "Prediction matrix Postpruning decision tree"
##    pred_postprun_tr
##        1    2
##  1 1178   32
##  2   91   56
## [1] "Prediction matrix Selected attribute model"
##    pred_select_attr
##        1    2
##  1 1176   34
##  2   97   50
## y ~ month + duration + pdays + poutcome
## [1] "Prediction matrix Base Decision tree "
##    pred_base_tr
##        1    2
##  1 1125   86
##  2   86   60
## [1] "Prediction matrix Preprune decision tree"
##    pred_preprun_tr
```

```
##        1    2
##   1 1171   40
##   2   98   48
## [1] "Prediction matrix Postpruning decision tree"
##    pred_postprun_tr
##        1    2
##   1 1178   33
##   2  109   37
## [1] "Prediction matrix Selected attribute model"
##    pred_select_attr
##        1    2
##   1 1167   44
##   2   90   56
## y ~ month + duration + pdays + poutcome
## [1] "Prediction matrix Base Decision tree "
##    pred_base_tr
##        1    2
##   1 1094   89
##   2   96   78
## [1] "Prediction matrix Preprune decision tree"
##    pred_preprun_tr
##        1    2
##   1 1147   36
##   2  128   46
## [1] "Prediction matrix Postpruning decision tree"
##    pred_postprun_tr
##        1    2
##   1 1151   32
##   2  129   45
## [1] "Prediction matrix Selected attribute model"
##    pred_select_attr
##        1    2
##   1 1154   29
##   2  126   48
## y ~ month + duration + pdays + poutcome
## [1] "Prediction matrix Base Decision tree "
##    pred_base_tr
##        1    2
##   1 1123   78
##   2   94   62
## [1] "Prediction matrix Preprune decision tree"
##    pred_preprun_tr
##        1    2
##   1 1160   41
##   2  103   53
## [1] "Prediction matrix Postpruning decision tree"
##    pred_postprun_tr
##        1    2
##   1 1159   42
##   2  104   52
## [1] "Prediction matrix Selected attribute model"
##    pred_select_attr
##        1    2
##   1 1168   33
```

```
##   2  106   50
## y ~ month + duration + pdays + poutcome
## [1] "Prediction matrix Base Decision tree "
##    pred_base_tr
##        1    2
##   1 1116   83
##   2   91   67
## [1] "Prediction matrix Preprune decision tree"
##    pred_preprun_tr
##        1    2
##   1 1158   41
##   2  112   46
## [1] "Prediction matrix Postpruning decision tree"
##    pred_postprun_tr
##        1    2
##   1 1162   37
##   2  116   42
## [1] "Prediction matrix Selected attribute model"
##    pred_select_attr
##        1    2
##   1 1167   32
##   2  120   38
## y ~ month + duration + pdays + poutcome
## [1] "Prediction matrix Base Decision tree "
##    pred_base_tr
##        1    2
##   1 1096   85
##   2  103   73
## [1] "Prediction matrix Preprune decision tree"
##    pred_preprun_tr
##        1    2
##   1 1151   30
##   2  121   55
## [1] "Prediction matrix Postpruning decision tree"
##    pred_postprun_tr
##        1    2
##   1 1150   31
##   2  118   58
## [1] "Prediction matrix Selected attribute model"
##    pred_select_attr
##        1    2
##   1 1166   15
##   2  144   32
## y ~ month + duration + pdays + poutcome
## [1] "Prediction matrix Base Decision tree "
##    pred_base_tr
##        1    2
##   1 1099   97
##   2   89   72
## [1] "Prediction matrix Preprune decision tree"
##    pred_preprun_tr
##        1    2
##   1 1179   17
##   2  122   39
```

```
## [1] "Prediction matrix Postpruning decision tree"
##    pred_postprun_tr
##        1    2
##   1 1175   21
##   2  116   45
## [1] "Prediction matrix Selected attribute model"
##    pred_select_attr
##        1    2
##   1 1178   18
##   2  120   41
## y ~ month + duration + pdays + poutcome
## [1] "Prediction matrix Base Decision tree "
##    pred_base_tr
##        1    2
##   1 1101  117
##   2   74   65
## [1] "Prediction matrix Preprune decision tree"
##    pred_preprun_tr
##        1    2
##   1 1185   33
##   2   91   48
## [1] "Prediction matrix Postpruning decision tree"
##    pred_postprun_tr
##        1    2
##   1 1187   31
##   2   91   48
## [1] "Prediction matrix Selected attribute model"
##    pred_select_attr
##        1    2
##   1 1191   27
##   2   98   41
## y ~ month + duration + pdays + poutcome
## [1] "Prediction matrix Base Decision tree "
##    pred_base_tr
##        1    2
##   1 1115   86
##   2  101   55
## [1] "Prediction matrix Preprune decision tree"
##    pred_preprun_tr
##        1    2
##   1 1168   33
##   2   99   57
## [1] "Prediction matrix Postpruning decision tree"
##    pred_postprun_tr
##        1    2
##   1 1174   27
##   2  105   51
## [1] "Prediction matrix Selected attribute model"
##    pred_select_attr
##        1    2
##   1 1181   20
##   2  120   36
## y ~ month + duration + pdays + poutcome
## [1] "Prediction matrix Base Decision tree "
```

```
##     pred_base_tr
##        1    2
##   1 1100   91
##   2  104   62
## [1] "Prediction matrix Preprune decision tree"
##     pred_preprun_tr
##        1    2
##   1 1146   45
##   2  111   55
## [1] "Prediction matrix Postpruning decision tree"
##     pred_postprun_tr
##        1    2
##   1 1156   35
##   2  122   44
## [1] "Prediction matrix Selected attribute model"
##     pred_select_attr
##        1    2
##   1 1157   34
##   2  125   41
## y ~ month + duration + pdays + poutcome
## [1] "Prediction matrix Base Decision tree "
##     pred_base_tr
##        1    2
##   1 1111  101
##   2   76   69
## [1] "Prediction matrix Preprune decision tree"
##     pred_preprun_tr
##        1    2
##   1 1163   49
##   2   99   46
## [1] "Prediction matrix Postpruning decision tree"
##     pred_postprun_tr
##        1    2
##   1 1156   56
##   2   94   51
## [1] "Prediction matrix Selected attribute model"
##     pred_select_attr
##        1    2
##   1 1163   49
##   2   96   49
## y ~ month + duration + pdays + poutcome
## [1] "Prediction matrix Base Decision tree "
##     pred_base_tr
##        1    2
##   1 1100   96
##   2   98   63
## [1] "Prediction matrix Preprune decision tree"
##     pred_preprun_tr
##        1    2
##   1 1157   39
##   2  117   44
## [1] "Prediction matrix Postpruning decision tree"
##     pred_postprun_tr
##        1    2
```

```
##   1 1148   48
##   2  114   47
## [1] "Prediction matrix Selected attribute model"
##     pred_select_attr
##        1    2
##   1 1176   20
##   2  128   33
## y ~ month + duration + pdays + poutcome
## [1] "Prediction matrix Base Decision tree "
##     pred_base_tr
##        1    2
##   1 1096   94
##   2   85   82
## [1] "Prediction matrix Preprune decision tree"
##     pred_preprun_tr
##        1    2
##   1 1138   52
##   2  105   62
## [1] "Prediction matrix Postpruning decision tree"
##     pred_postprun_tr
##        1    2
##   1 1157   33
##   2  121   46
## [1] "Prediction matrix Selected attribute model"
##     pred_select_attr
##        1    2
##   1 1153   37
##   2  108   59
## y ~ month + duration + pdays + poutcome
## [1] "Prediction matrix Base Decision tree "
##     pred_base_tr
##        1    2
##   1 1100   96
##   2   90   71
## [1] "Prediction matrix Preprune decision tree"
##     pred_preprun_tr
##        1    2
##   1 1169   27
##   2  111   50
## [1] "Prediction matrix Postpruning decision tree"
##     pred_postprun_tr
##        1    2
##   1 1161   35
##   2  110   51
## [1] "Prediction matrix Selected attribute model"
##     pred_select_attr
##        1    2
##   1 1174   22
##   2  119   42
## y ~ month + duration + pdays + poutcome
## [1] "Prediction matrix Base Decision tree "
##     pred_base_tr
##        1    2
##   1 1106   89
```

```
##   2   81   81
## [1] "Prediction matrix Preprune decision tree"
##    pred_preprun_tr
##         1    2
##   1 1176   19
##   2  115   47
## [1] "Prediction matrix Postpruning decision tree"
##    pred_postprun_tr
##         1    2
##   1 1168   27
##   2  101   61
## [1] "Prediction matrix Selected attribute model"
##    pred_select_attr
##         1    2
##   1 1164   31
##   2   96   66
## y ~ month + duration + pdays + poutcome
## [1] "Prediction matrix Base Decision tree "
##    pred_base_tr
##         1    2
##   1 1093  100
##   2   82   82
## [1] "Prediction matrix Preprune decision tree"
##    pred_preprun_tr
##         1    2
##   1 1143   50
##   2  101   63
## [1] "Prediction matrix Postpruning decision tree"
##    pred_postprun_tr
##         1    2
##   1 1143   50
##   2  101   63
## [1] "Prediction matrix Selected attribute model"
##    pred_select_attr
##         1    2
##   1 1169   24
##   2  112   52
## y ~ month + duration + pdays + poutcome
## [1] "Prediction matrix Base Decision tree "
##    pred_base_tr
##         1    2
##   1 1114   88
##   2   93   62
## [1] "Prediction matrix Preprune decision tree"
##    pred_preprun_tr
##         1    2
##   1 1166   36
##   2  105   50
## [1] "Prediction matrix Postpruning decision tree"
##    pred_postprun_tr
##         1    2
##   1 1179   23
##   2  115   40
## [1] "Prediction matrix Selected attribute model"
```

```
##    pred_select_attr
##        1    2
##    1 1179   23
##    2  115   40
## y ~ month + duration + pdays + poutcome
## [1] "Prediction matrix Base Decision tree "
##    pred_base_tr
##        1    2
##    1 1093  110
##    2   80   74
## [1] "Prediction matrix Preprune decision tree"
##    pred_preprun_tr
##        1    2
##    1 1168   35
##    2  100   54
## [1] "Prediction matrix Postpruning decision tree"
##    pred_postprun_tr
##        1    2
##    1 1169   34
##    2  102   52
## [1] "Prediction matrix Selected attribute model"
##    pred_select_attr
##        1    2
##    1 1170   33
##    2   92   62
## y ~ month + duration + pdays + poutcome
## [1] "Prediction matrix Base Decision tree "
##    pred_base_tr
##        1    2
##    1 1116   84
##    2  103   54
## [1] "Prediction matrix Preprune decision tree"
##    pred_preprun_tr
##        1    2
##    1 1167   33
##    2  107   50
## [1] "Prediction matrix Postpruning decision tree"
##    pred_postprun_tr
##        1    2
##    1 1172   28
##    2  109   48
## [1] "Prediction matrix Selected attribute model"
##    pred_select_attr
##        1    2
##    1 1183   17
##    2  119   38
## y ~ month + duration + pdays + poutcome
## [1] "Prediction matrix Base Decision tree "
##    pred_base_tr
##        1    2
##    1 1130   63
##    2   95   69
## [1] "Prediction matrix Preprune decision tree"
##    pred_preprun_tr
```

```
##        1    2
##   1 1166   27
##   2  115   49
## [1] "Prediction matrix Postpruning decision tree"
##    pred_postprun_tr
##        1    2
##   1 1162   31
##   2  112   52
## [1] "Prediction matrix Selected attribute model"
##    pred_select_attr
##        1    2
##   1 1171   22
##   2  115   49
## y ~ month + duration + pdays + poutcome
## [1] "Prediction matrix Base Decision tree "
##    pred_base_tr
##        1    2
##   1 1129   97
##   2   74   57
## [1] "Prediction matrix Preprune decision tree"
##    pred_preprun_tr
##        1    2
##   1 1175   51
##   2   74   57
## [1] "Prediction matrix Postpruning decision tree"
##    pred_postprun_tr
##        1    2
##   1 1182   44
##   2   83   48
## [1] "Prediction matrix Selected attribute model"
##    pred_select_attr
##        1    2
##   1 1187   39
##   2   89   42
## y ~ month + duration + pdays + poutcome
## [1] "Prediction matrix Base Decision tree "
##    pred_base_tr
##        1    2
##   1 1097   98
##   2   98   64
## [1] "Prediction matrix Preprune decision tree"
##    pred_preprun_tr
##        1    2
##   1 1151   44
##   2  105   57
## [1] "Prediction matrix Postpruning decision tree"
##    pred_postprun_tr
##        1    2
##   1 1148   47
##   2  103   59
## [1] "Prediction matrix Selected attribute model"
##    pred_select_attr
##        1    2
##   1 1157   38
```

```
##   2  105   57
## y ~ month + duration + pdays + poutcome
## [1] "Prediction matrix Base Decision tree "
##    pred_base_tr
##         1    2
##   1 1102   96
##   2   93   66
## [1] "Prediction matrix Preprune decision tree"
##    pred_preprun_tr
##         1    2
##   1 1165   33
##   2  100   59
## [1] "Prediction matrix Postpruning decision tree"
##    pred_postprun_tr
##         1    2
##   1 1161   37
##   2  104   55
## [1] "Prediction matrix Selected attribute model"
##    pred_select_attr
##         1    2
##   1 1171   27
##   2  106   53
## y ~ month + duration + pdays + poutcome
## [1] "Prediction matrix Base Decision tree "
##    pred_base_tr
##         1    2
##   1 1100   95
##   2   91   71
## [1] "Prediction matrix Preprune decision tree"
##    pred_preprun_tr
##         1    2
##   1 1159   36
##   2  109   53
## [1] "Prediction matrix Postpruning decision tree"
##    pred_postprun_tr
##         1    2
##   1 1160   35
##   2  110   52
## [1] "Prediction matrix Selected attribute model"
##    pred_select_attr
##         1    2
##   1 1173   22
##   2  112   50
## y ~ month + duration + pdays + poutcome
## [1] "Prediction matrix Base Decision tree "
##    pred_base_tr
##         1    2
##   1 1097   90
##   2  118   52
## [1] "Prediction matrix Preprune decision tree"
##    pred_preprun_tr
##         1    2
##   1 1174   13
##   2  146   24
```

```
## [1] "Prediction matrix Postpruning decision tree"
##    pred_postprun_tr
##         1    2
##    1 1169   18
##    2  138   32
## [1] "Prediction matrix Selected attribute model"
##    pred_select_attr
##         1    2
##    1 1167   20
##    2  134   36
```
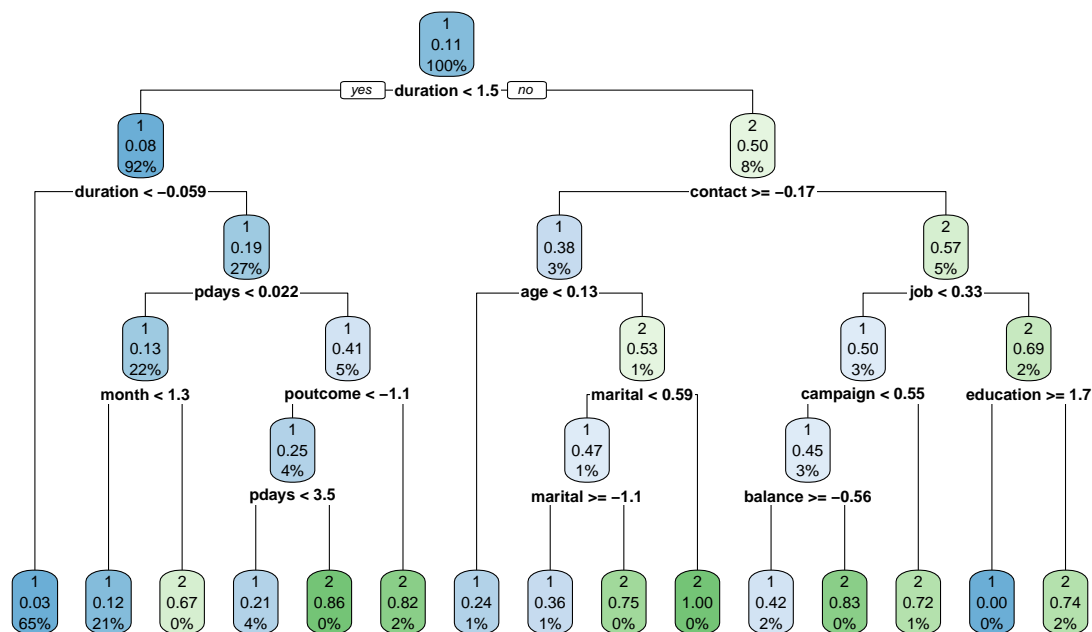
```
## Warning: labs do not fit even at cex 0.15, there may be some overplotting
```

Full Tree bank.csv

Prepruned Decision Tree bank.csv
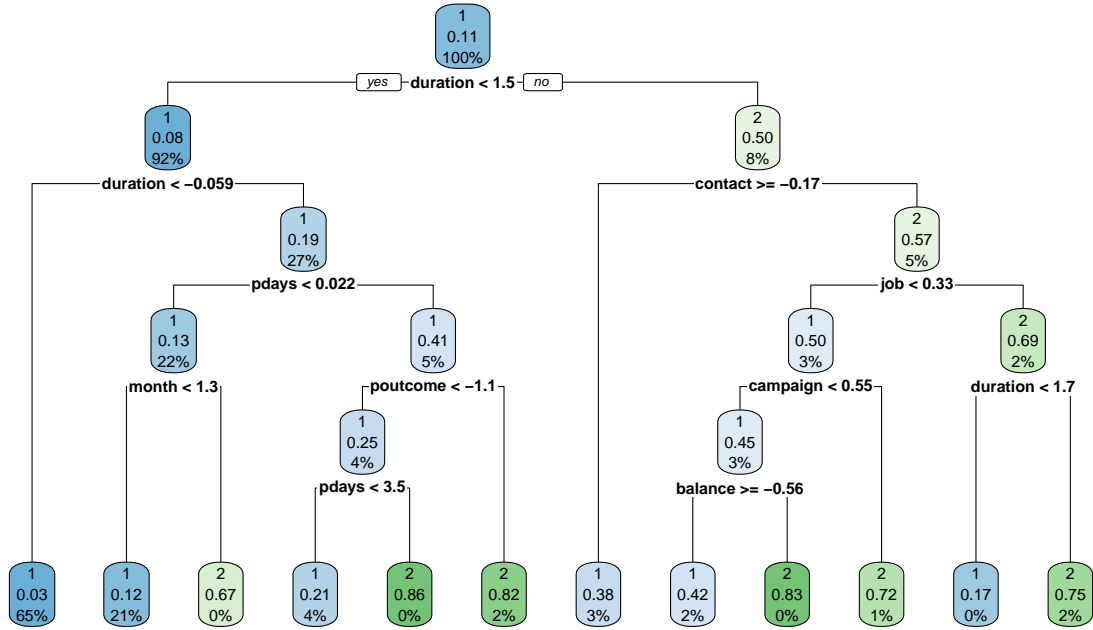
Postpruned Decision Tree bank.csv


```
## [1] "==========   Wstępna analiza danych bazy: ========== mashroom.csv"
## [1] "==========   Summary: ========== mashroom.csv"
##    cap.shape      cap.surface      cap.color         bruises
##  Min.   :1.000   Min.   :1.000   Min.   : 1.000   Min.   :1.000
##  1st Qu.:3.000   1st Qu.:1.000   1st Qu.: 4.000   1st Qu.:1.000
##  Median :4.000   Median :3.000   Median : 5.000   Median :1.000
##  Mean   :4.348   Mean   :2.828   Mean   : 5.505   Mean   :1.415
##  3rd Qu.:6.000   3rd Qu.:4.000   3rd Qu.: 9.000   3rd Qu.:2.000
##  Max.   :6.000   Max.   :4.000   Max.   :10.000   Max.   :2.000
##       odor        gill.attachment gill.spacing     gill.size
##  Min.   :1.000   Min.   :1.000   Min.   :1.000   Min.   :1.000
##  1st Qu.:3.000   1st Qu.:2.000   1st Qu.:1.000   1st Qu.:1.000
##  Median :6.000   Median :2.000   Median :1.000   Median :1.000
##  Mean   :5.145   Mean   :1.974   Mean   :1.162   Mean   :1.309
##  3rd Qu.:6.000   3rd Qu.:2.000   3rd Qu.:1.000   3rd Qu.:2.000
##  Max.   :9.000   Max.   :2.000   Max.   :2.000   Max.   :2.000
##    gill.color      stalk.shape      stalk.root     stalk.surface.above.ring
##  Min.   : 1.000   Min.   :1.000   Min.   :1.000   Min.   :1.000
##  1st Qu.: 3.000   1st Qu.:1.000   1st Qu.:1.000   1st Qu.:2.000
##  Median : 6.000   Median :2.000   Median :1.000   Median :3.000
##  Mean   : 5.811   Mean   :1.567   Mean   :1.415   Mean   :2.575
##  3rd Qu.: 8.000   3rd Qu.:2.000   3rd Qu.:1.000   3rd Qu.:3.000
##  Max.   :12.000   Max.   :2.000   Max.   :4.000   Max.   :4.000
##  stalk.surface.below.ring stalk.color.above.ring stalk.color.below.ring
##  Min.   :1.000            Min.   :1.000          Min.   :1.000
##  1st Qu.:2.000            1st Qu.:7.000          1st Qu.:7.000
```

```
## Median  :3.000          Median  :8.000          Median  :8.000
## Mean    :2.604          Mean    :6.816          Mean    :6.795
## 3rd Qu.:3.000           3rd Qu.:8.000           3rd Qu.:8.000
## Max.    :4.000          Max.    :9.000          Max.    :9.000
##     veil.color     ring.number      ring.type     spore.print.color
## Min.    :1.000   Min.    :1.000   Min.    :1.000   Min.    :1.000
## 1st Qu.:3.000    1st Qu.:2.000    1st Qu.:1.000    1st Qu.:3.000
## Median :3.000    Median :2.000    Median :3.000    Median :4.000
## Mean    :2.966   Mean    :2.069   Mean    :3.292   Mean    :4.597
## 3rd Qu.:3.000    3rd Qu.:2.000    3rd Qu.:5.000    3rd Qu.:8.000
## Max.    :4.000   Max.    :3.000   Max.    :5.000   Max.    :9.000
##     population       habitat          class
## Min.    :1.000   Min.    :1.000   Min.    :1.000
## 1st Qu.:4.000    1st Qu.:1.000    1st Qu.:1.000
## Median :5.000    Median :2.000    Median :1.000
## Mean    :4.644   Mean    :2.508   Mean    :1.482
## 3rd Qu.:5.000    3rd Qu.:3.000    3rd Qu.:2.000
## Max.    :6.000   Max.    :7.000   Max.    :2.000
## [1] "*********************************************************"
## [1] "*********************************************************"
## [1] "*********************************************************"
## [1] "==========  Structure: ==========  mashroom.csv"
## 'data.frame':    8123 obs. of  22 variables:
## $ cap.shape              : int  6 1 6 6 6 1 1 6 1 6 ...
## $ cap.surface            : int  3 3 4 3 4 3 4 4 3 4 ...
## $ cap.color              : int  10 9 9 4 10 9 9 9 10 10 ...
## $ bruises                : int  2 2 2 1 2 2 2 2 2 2 ...
## $ odor                   : int  1 4 7 6 1 1 4 7 1 4 ...
## $ gill.attachment        : int  2 2 2 2 2 2 2 2 2 2 ...
## $ gill.spacing           : int  1 1 1 2 1 1 1 1 1 1 ...
## $ gill.size              : int  1 1 2 1 1 1 1 2 1 1 ...
## $ gill.color             : int  5 6 6 5 6 3 6 8 3 3 ...
## $ stalk.shape            : int  1 1 1 2 1 1 1 1 1 1 ...
## $ stalk.root             : int  2 2 3 3 2 2 2 3 2 2 ...
## $ stalk.surface.above.ring: int  3 3 3 3 3 3 3 3 3 3 ...
## $ stalk.surface.below.ring: int  3 3 3 3 3 3 3 3 3 3 ...
## $ stalk.color.above.ring : int  8 8 8 8 8 8 8 8 8 8 ...
## $ stalk.color.below.ring : int  8 8 8 8 8 8 8 8 8 8 ...
## $ veil.color             : int  3 3 3 3 3 3 3 3 3 3 ...
## $ ring.number            : int  2 2 2 2 2 2 2 2 2 2 ...
## $ ring.type              : int  5 5 5 1 5 5 5 5 5 5 ...
## $ spore.print.color      : int  4 4 3 4 3 3 4 3 3 4 ...
## $ population             : int  3 3 4 1 3 3 4 5 4 3 ...
## $ habitat                : int  2 4 6 2 2 4 4 2 4 2 ...
## $ class                  : int  1 1 2 1 1 1 1 2 1 1 ...
## NULL
## [1] "*********************************************************"
## [1] "*********************************************************"
## [1] "*********************************************************"
## [1] "*********************************************************"
## [1] "==========  Attribute data type: ==========  mashroom.csv"
##                cap.shape              cap.surface              cap.color
##                "integer"                "integer"                "integer"
##                  bruises                     odor          gill.attachment
```

```
##               "integer"                    "integer"                   "integer"
##            gill.spacing                    gill.size                  gill.color
##               "integer"                    "integer"                   "integer"
##             stalk.shape                   stalk.root  stalk.surface.above.ring
##               "integer"                    "integer"                   "integer"
## stalk.surface.below.ring      stalk.color.above.ring     stalk.color.below.ring
##               "integer"                    "integer"                   "integer"
##              veil.color                  ring.number                  ring.type
##               "integer"                    "integer"                   "integer"
##       spore.print.color                   population                    habitat
##               "integer"                    "integer"                   "integer"
##                   class
##               "integer"
## [1] "*************************************************************"
## [1] "*************************************************************"
## [1] "*************************************************************"
## [1] "*************************************************************"
## [1] "==========  First samples: ==========  mashroom.csv"
##   cap.shape cap.surface cap.color bruises odor gill.attachment
## 1         6           3        10       2    1               2
## 2         1           3         9       2    4               2
## 3         6           4         9       2    7               2
## 4         6           3         4       1    6               2
## 5         6           4        10       2    1               2
## 6         1           3         9       2    1               2
##   gill.spacing gill.size gill.color stalk.shape stalk.root
## 1            1         1          5           1          2
## 2            1         1          6           1          2
## 3            1         2          6           1          3
## 4            2         1          5           2          3
## 5            1         1          6           1          2
## 6            1         1          3           1          2
##   stalk.surface.above.ring stalk.surface.below.ring stalk.color.above.ring
## 1                        3                        3                      8
## 2                        3                        3                      8
## 3                        3                        3                      8
## 4                        3                        3                      8
## 5                        3                        3                      8
## 6                        3                        3                      8
##   stalk.color.below.ring veil.color ring.number ring.type
## 1                      8          3           2         5
## 2                      8          3           2         5
## 3                      8          3           2         5
## 4                      8          3           2         1
## 5                      8          3           2         5
## 6                      8          3           2         5
##   spore.print.color population habitat class
## 1                 4          3       2     1
## 2                 4          3       4     1
## 3                 3          4       6     2
## 4                 4          1       2     1
## 5                 3          3       2     1
## 6                 3          3       4     1
## [1] "*************************************************************"
```

```
## [1] "*************************************************************"
## [1] "*************************************************************"
## [1] "==========   Last samples: ========== mashroom.csv"
##      cap.shape cap.surface cap.color bruises odor gill.attachment
## 8118         4           4         5       1    3               2
## 8119         4           3         5       1    6               1
## 8120         6           3         5       1    6               1
## 8121         3           3         5       1    6               1
## 8122         4           4         5       1    9               2
## 8123         6           3         5       1    6               1
##      gill.spacing gill.size gill.color stalk.shape stalk.root
## 8118            1         2          1           2          1
## 8119            1         1         12           1          1
## 8120            1         1         12           1          1
## 8121            1         1          6           1          1
## 8122            1         2          1           2          1
## 8123            1         1         12           1          1
##      stalk.surface.above.ring stalk.surface.below.ring
## 8118                        2                        3
## 8119                        3                        3
## 8120                        3                        3
## 8121                        3                        3
## 8122                        3                        2
## 8123                        3                        3
##      stalk.color.above.ring stalk.color.below.ring veil.color ring.number
## 8118                      7                      8          3           2
## 8119                      6                      6          2           2
## 8120                      6                      6          1           2
## 8121                      6                      6          2           2
## 8122                      8                      8          3           2
## 8123                      6                      6          2           2
##      ring.type spore.print.color population habitat class
## 8118         1                 8          5       1     2
## 8119         5                 1          2       3     1
## 8120         5                 1          5       3     1
## 8121         5                 1          2       3     1
## 8122         1                 8          5       3     2
## 8123         5                 5          2       3     1
## [1] "*************************************************************"
## [1] "*************************************************************"
## [1] "*************************************************************"
## [1] "*************************************************************"
## [1] "==========   Dataset Dimenssions: ========== mashroom.csv"
## [1] 8123   22
## [1] "==========   Histogram Plot of  Decision Classes: ========== mashroom.csv"
```

wykres atrybutu decyzji mashroom.csv
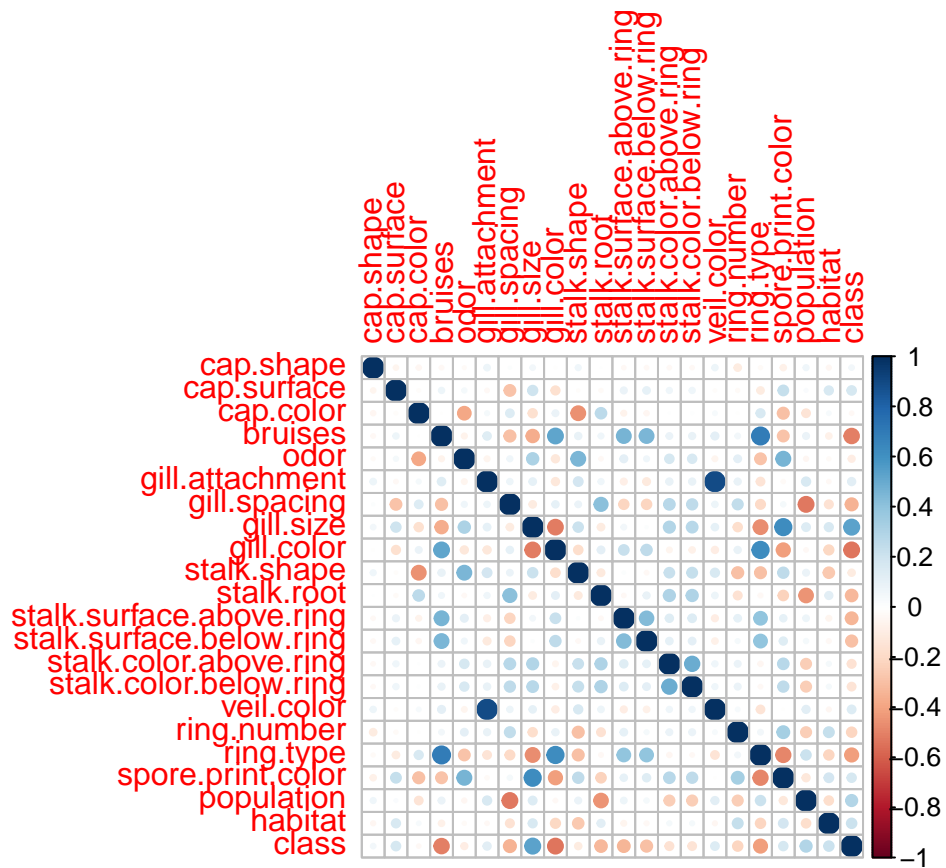


```
## [1] "==========  Desity Plot of  Decision Classes: ========== mashroom.csv"
```
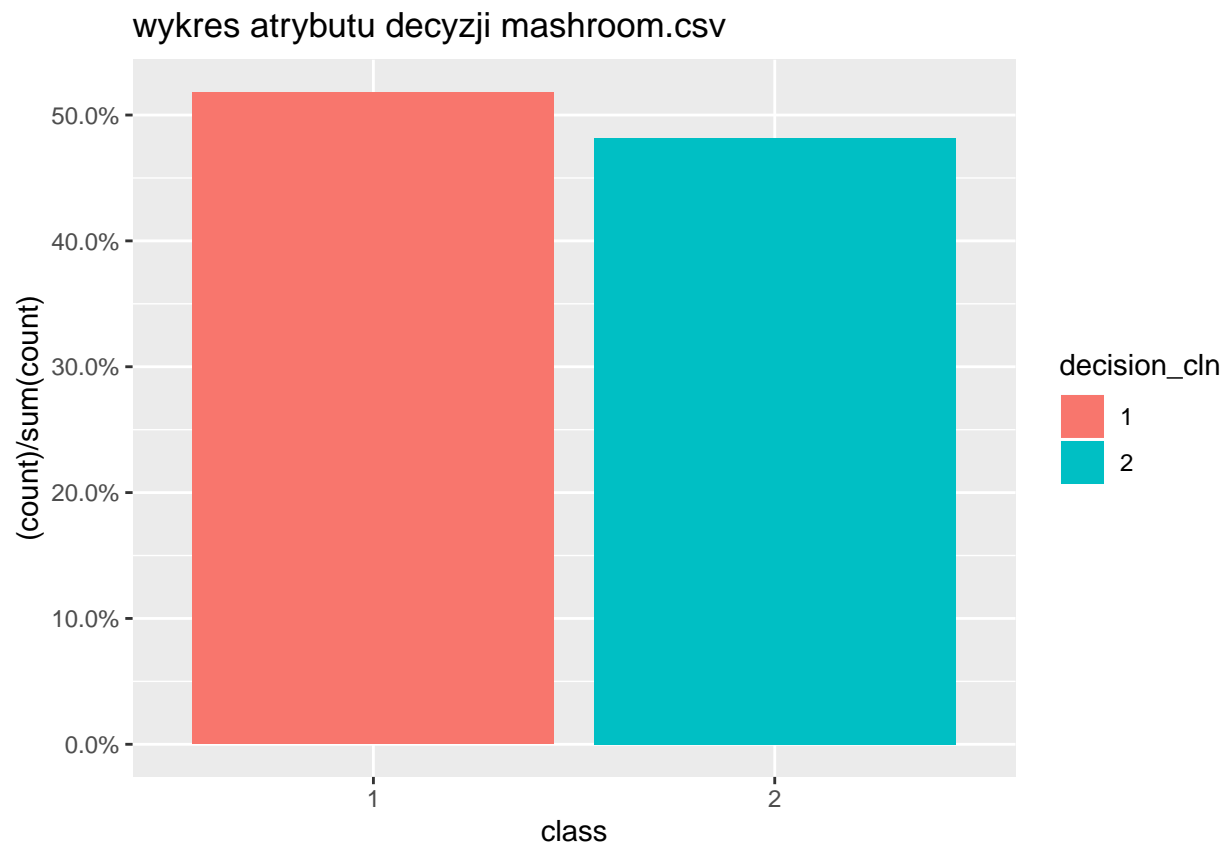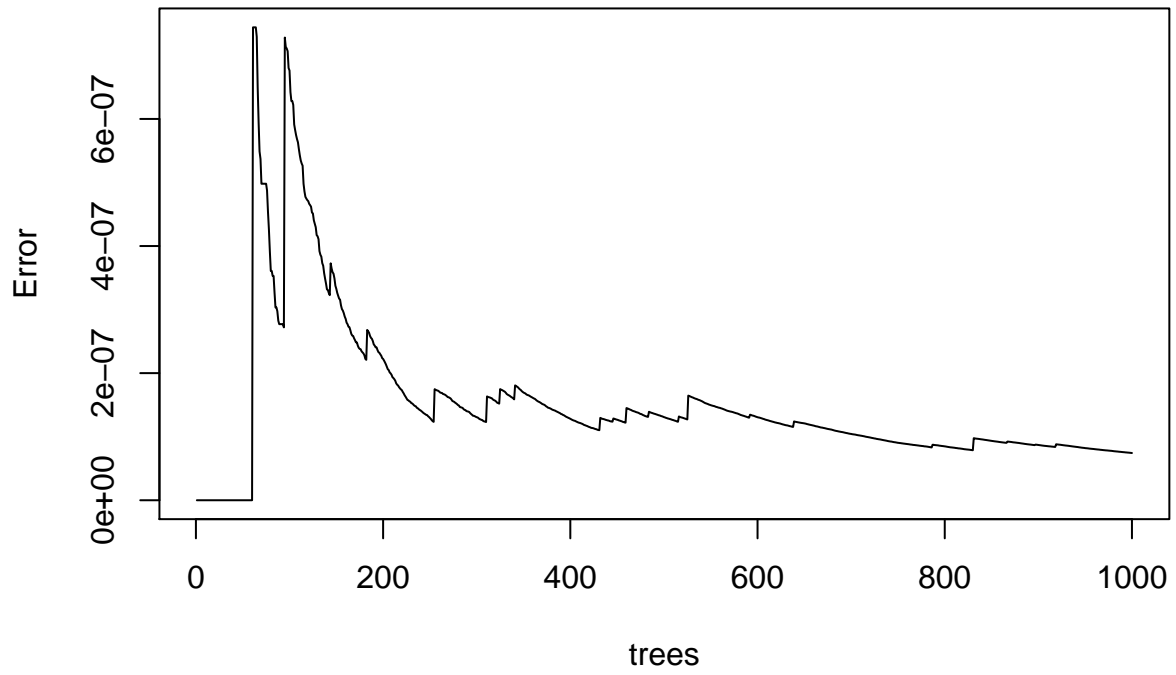
wykres atrybutu decyzji mashroom.csv
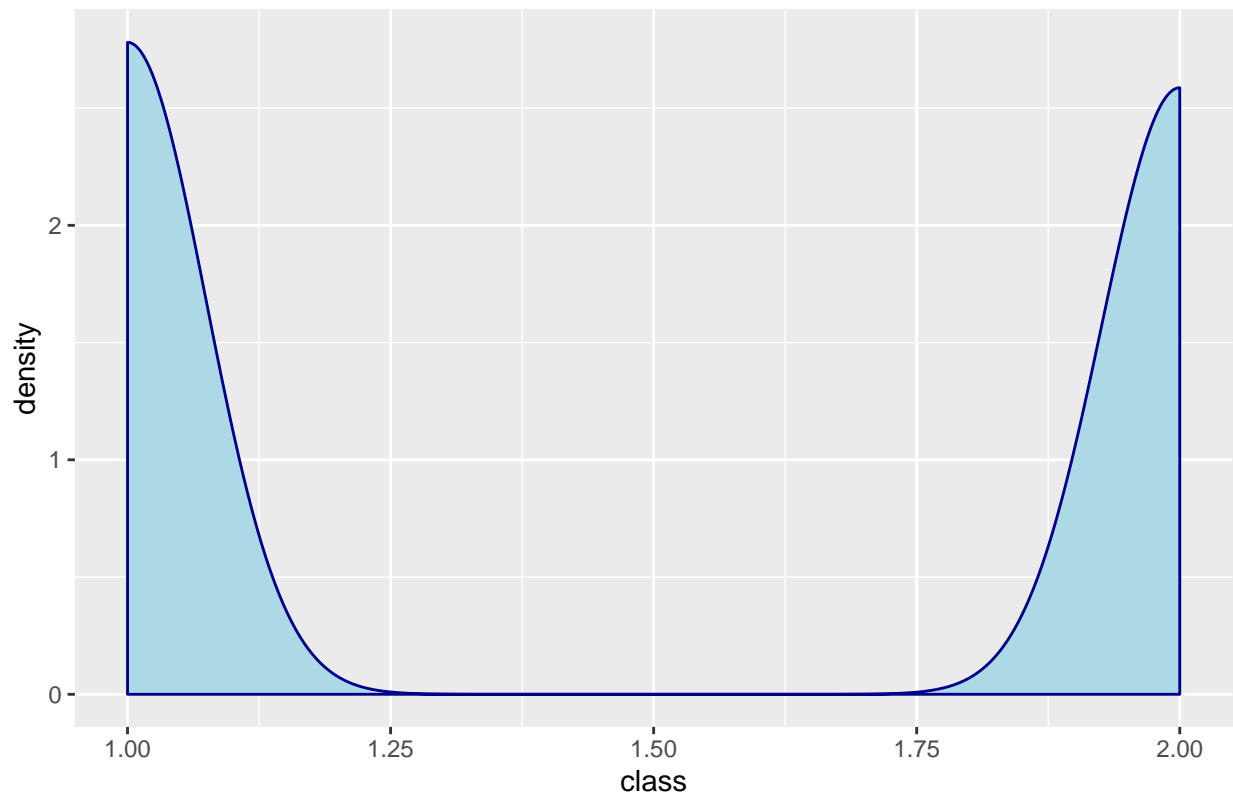

```
## [1] "==========  Correlation Plot of  Dataframe: ========== mashroom.csv"
```

```
## Warning in randomForest.default(m, y, ...): The response has five or fewer
## unique values. Are you sure you want to do regression?
```

Baza mashroom.csv

Baza mashroom.csv
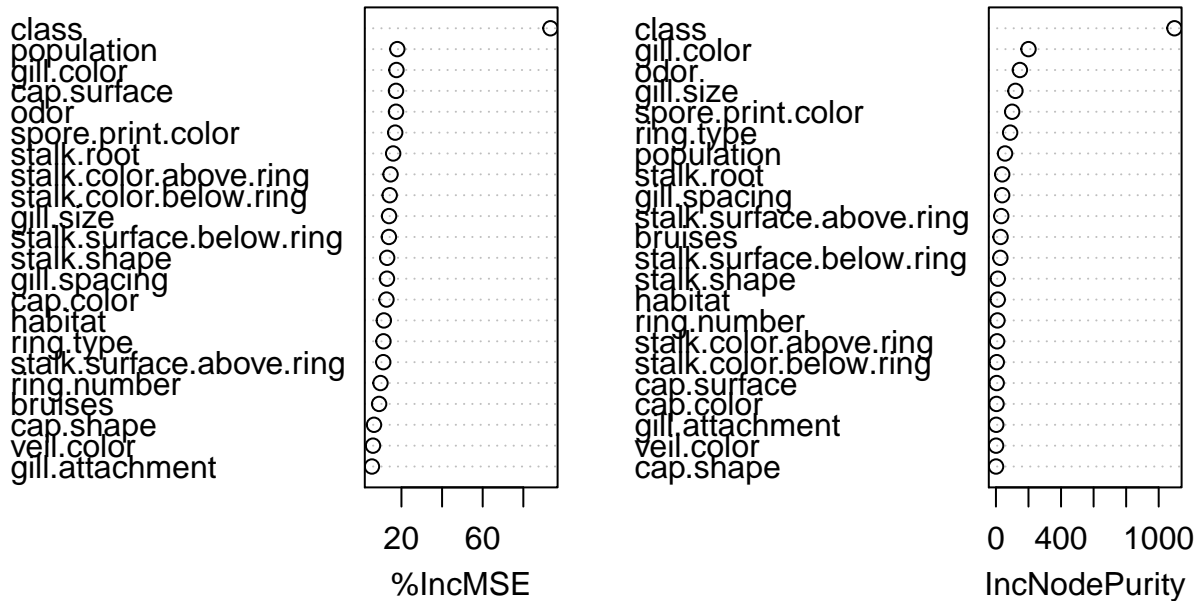

```
## class ~ odor + gill.size + gill.color + ring.type + spore.print.color +
##     population
## [1] "Prediction matrix Base Decision tree "
##     pred_base_tr
##         1    2
##   1 1260    0
##   2    0 1177
## [1] "Prediction matrix Preprune decision tree"
##     pred_preprun_tr
##         1    2
##   1 1247   13
##   2   25 1152
## [1] "Prediction matrix Postpruning decision tree"
##     pred_postprun_tr
##         1    2
##   1 1260    0
##   2    0 1177
## [1] "Prediction matrix Selected attribute model"
##     pred_select_attr
##         1    2
##   1 1247   13
##   2   44 1133
## class ~ odor + gill.size + gill.color + ring.type + spore.print.color +
##     population
## [1] "Prediction matrix Base Decision tree "
##     pred_base_tr
```

```
##        1    2
##   1 1261    0
##   2    0 1176
## [1] "Prediction matrix Preprune decision tree"
##    pred_preprun_tr
##        1    2
##   1 1251   10
##   2   36 1140
## [1] "Prediction matrix Postpruning decision tree"
##    pred_postprun_tr
##        1    2
##   1 1261    0
##   2    0 1176
## [1] "Prediction matrix Selected attribute model"
##    pred_select_attr
##        1    2
##   1 1251   10
##   2   65 1111
## class ~ odor + gill.size + gill.color + ring.type + spore.print.color +
##     population
## [1] "Prediction matrix Base Decision tree "
##    pred_base_tr
##        1    2
##   1 1257    0
##   2    0 1180
## [1] "Prediction matrix Preprune decision tree"
##    pred_preprun_tr
##        1    2
##   1 1239   18
##   2   32 1148
## [1] "Prediction matrix Postpruning decision tree"
##    pred_postprun_tr
##        1    2
##   1 1257    0
##   2    0 1180
## [1] "Prediction matrix Selected attribute model"
##    pred_select_attr
##        1    2
##   1 1247   10
##   2   66 1114
## class ~ odor + gill.size + gill.color + ring.type + spore.print.color +
##     population
## [1] "Prediction matrix Base Decision tree "
##    pred_base_tr
##        1    2
##   1 1277    0
##   2    0 1160
## [1] "Prediction matrix Preprune decision tree"
##    pred_preprun_tr
##        1    2
##   1 1244   33
##   2   43 1117
## [1] "Prediction matrix Postpruning decision tree"
##    pred_postprun_tr
```

```
##         1    2
##   1 1277    0
##   2    0 1160
## [1] "Prediction matrix Selected attribute model"
##    pred_select_attr
##         1    2
##   1 1268    9
##   2   76 1084
## class ~ odor + gill.size + gill.color + ring.type + spore.print.color +
##     population
## [1] "Prediction matrix Base Decision tree "
##    pred_base_tr
##         1    2
##   1 1273    0
##   2    0 1164
## [1] "Prediction matrix Preprune decision tree"
##    pred_preprun_tr
##         1    2
##   1 1227   46
##   2   22 1142
## [1] "Prediction matrix Postpruning decision tree"
##    pred_postprun_tr
##         1    2
##   1 1273    0
##   2    0 1164
## [1] "Prediction matrix Selected attribute model"
##    pred_select_attr
##         1    2
##   1 1263   10
##   2   58 1106
## class ~ odor + gill.size + gill.color + ring.type + spore.print.color +
##     population
## [1] "Prediction matrix Base Decision tree "
##    pred_base_tr
##         1    2
##   1 1318    0
##   2    0 1119
## [1] "Prediction matrix Preprune decision tree"
##    pred_preprun_tr
##         1    2
##   1 1299   19
##   2   33 1086
## [1] "Prediction matrix Postpruning decision tree"
##    pred_postprun_tr
##         1    2
##   1 1318    0
##   2    0 1119
## [1] "Prediction matrix Selected attribute model"
##    pred_select_attr
##         1    2
##   1 1308   10
##   2   50 1069
## class ~ odor + gill.size + gill.color + ring.type + spore.print.color +
##     population
```

```
## [1] "Prediction matrix Base Decision tree "
##    pred_base_tr
##         1    2
##   1 1256    0
##   2    0 1181
## [1] "Prediction matrix Preprune decision tree"
##    pred_preprun_tr
##         1    2
##   1 1245   11
##   2   37 1144
## [1] "Prediction matrix Postpruning decision tree"
##    pred_postprun_tr
##         1    2
##   1 1256    0
##   2    0 1181
## [1] "Prediction matrix Selected attribute model"
##    pred_select_attr
##         1    2
##   1 1245   11
##   2   65 1116
## class ~ odor + gill.size + gill.color + ring.type + spore.print.color +
##      population
## [1] "Prediction matrix Base Decision tree "
##    pred_base_tr
##         1    2
##   1 1266    0
##   2    0 1171
## [1] "Prediction matrix Preprune decision tree"
##    pred_preprun_tr
##         1    2
##   1 1258    8
##   2   28 1143
## [1] "Prediction matrix Postpruning decision tree"
##    pred_postprun_tr
##         1    2
##   1 1266    0
##   2    0 1171
## [1] "Prediction matrix Selected attribute model"
##    pred_select_attr
##         1    2
##   1 1258    8
##   2   61 1110
## class ~ odor + gill.size + gill.color + ring.type + spore.print.color +
##      population
## [1] "Prediction matrix Base Decision tree "
##    pred_base_tr
##         1    2
##   1 1232    0
##   2    0 1205
## [1] "Prediction matrix Preprune decision tree"
##    pred_preprun_tr
##         1    2
##   1 1222   10
##   2   34 1171
```

```
## [1] "Prediction matrix Postpruning decision tree"
##    pred_postprun_tr
##        1    2
##   1 1232    0
##   2    0 1205
## [1] "Prediction matrix Selected attribute model"
##    pred_select_attr
##        1    2
##   1 1222   10
##   2   59 1146
## class ~ odor + gill.size + gill.color + ring.type + spore.print.color +
##     population
## [1] "Prediction matrix Base Decision tree "
##    pred_base_tr
##        1    2
##   1 1258    0
##   2    0 1179
## [1] "Prediction matrix Preprune decision tree"
##    pred_preprun_tr
##        1    2
##   1 1251    7
##   2   21 1158
## [1] "Prediction matrix Postpruning decision tree"
##    pred_postprun_tr
##        1    2
##   1 1258    0
##   2    0 1179
## [1] "Prediction matrix Selected attribute model"
##    pred_select_attr
##        1    2
##   1 1251    7
##   2   53 1126
## class ~ odor + gill.size + gill.color + ring.type + spore.print.color +
##     population
## [1] "Prediction matrix Base Decision tree "
##    pred_base_tr
##        1    2
##   1 1252    0
##   2    0 1185
## [1] "Prediction matrix Preprune decision tree"
##    pred_preprun_tr
##        1    2
##   1 1245    7
##   2   35 1150
## [1] "Prediction matrix Postpruning decision tree"
##    pred_postprun_tr
##        1    2
##   1 1252    0
##   2    0 1185
## [1] "Prediction matrix Selected attribute model"
##    pred_select_attr
##        1    2
##   1 1245    7
##   2   45 1140
```

```
## class ~ odor + gill.size + gill.color + ring.type + spore.print.color +
##     population
## [1] "Prediction matrix Base Decision tree "
##    pred_base_tr
##        1    2
##   1 1270    0
##   2    0 1167
## [1] "Prediction matrix Preprune decision tree"
##    pred_preprun_tr
##        1    2
##   1 1259   11
##   2   16 1151
## [1] "Prediction matrix Postpruning decision tree"
##    pred_postprun_tr
##        1    2
##   1 1270    0
##   2    0 1167
## [1] "Prediction matrix Selected attribute model"
##    pred_select_attr
##        1    2
##   1 1259   11
##   2   53 1114
## class ~ odor + gill.size + gill.color + ring.type + spore.print.color +
##     population
## [1] "Prediction matrix Base Decision tree "
##    pred_base_tr
##        1    2
##   1 1224    0
##   2    0 1213
## [1] "Prediction matrix Preprune decision tree"
##    pred_preprun_tr
##        1    2
##   1 1215    9
##   2   34 1179
## [1] "Prediction matrix Postpruning decision tree"
##    pred_postprun_tr
##        1    2
##   1 1224    0
##   2    0 1213
## [1] "Prediction matrix Selected attribute model"
##    pred_select_attr
##        1    2
##   1 1215    9
##   2   74 1139
## class ~ odor + gill.size + gill.color + ring.type + spore.print.color +
##     population
## [1] "Prediction matrix Base Decision tree "
##    pred_base_tr
##        1    2
##   1 1260    0
##   2    0 1177
## [1] "Prediction matrix Preprune decision tree"
##    pred_preprun_tr
##        1    2
```

```
##   1 1251    9
##   2   24 1153
## [1] "Prediction matrix Postpruning decision tree"
##    pred_postprun_tr
##        1    2
##   1 1260    0
##   2    0 1177
## [1] "Prediction matrix Selected attribute model"
##    pred_select_attr
##        1    2
##   1 1251    9
##   2   61 1116
## class ~ odor + gill.size + gill.color + ring.type + spore.print.color +
##     population
## [1] "Prediction matrix Base Decision tree "
##    pred_base_tr
##        1    2
##   1 1239    3
##   2    0 1195
## [1] "Prediction matrix Preprune decision tree"
##    pred_preprun_tr
##        1    2
##   1 1221   21
##   2   35 1160
## [1] "Prediction matrix Postpruning decision tree"
##    pred_postprun_tr
##        1    2
##   1 1239    3
##   2    0 1195
## [1] "Prediction matrix Selected attribute model"
##    pred_select_attr
##        1    2
##   1 1231   11
##   2   53 1142
## class ~ odor + gill.size + gill.color + ring.type + spore.print.color +
##     population
## [1] "Prediction matrix Base Decision tree "
##    pred_base_tr
##        1    2
##   1 1251    0
##   2    0 1186
## [1] "Prediction matrix Preprune decision tree"
##    pred_preprun_tr
##        1    2
##   1 1236   15
##   2   38 1148
## [1] "Prediction matrix Postpruning decision tree"
##    pred_postprun_tr
##        1    2
##   1 1251    0
##   2    0 1186
## [1] "Prediction matrix Selected attribute model"
##    pred_select_attr
##        1    2
```

```
##   1 1236   15
##   2   68 1118
## class ~ odor + gill.size + gill.color + ring.type + spore.print.color +
##     population
## [1] "Prediction matrix Base Decision tree "
##     pred_base_tr
##         1    2
##   1 1282    3
##   2    0 1152
## [1] "Prediction matrix Preprune decision tree"
##     pred_preprun_tr
##         1    2
##   1 1265   20
##   2   29 1123
## [1] "Prediction matrix Postpruning decision tree"
##     pred_postprun_tr
##         1    2
##   1 1276    9
##   2    0 1152
## [1] "Prediction matrix Selected attribute model"
##     pred_select_attr
##         1    2
##   1 1277    8
##   2   69 1083
## class ~ odor + gill.size + gill.color + ring.type + spore.print.color +
##     population
## [1] "Prediction matrix Base Decision tree "
##     pred_base_tr
##         1    2
##   1 1221    0
##   2    0 1216
## [1] "Prediction matrix Preprune decision tree"
##     pred_preprun_tr
##         1    2
##   1 1215    6
##   2   42 1174
## [1] "Prediction matrix Postpruning decision tree"
##     pred_postprun_tr
##         1    2
##   1 1221    0
##   2    0 1216
## [1] "Prediction matrix Selected attribute model"
##     pred_select_attr
##         1    2
##   1 1215    6
##   2   75 1141
## class ~ odor + gill.size + gill.color + ring.type + spore.print.color +
##     population
## [1] "Prediction matrix Base Decision tree "
##     pred_base_tr
##         1    2
##   1 1285    0
##   2    0 1152
## [1] "Prediction matrix Preprune decision tree"
```

```
##    pred_preprun_tr
##        1    2
##   1 1274   11
##   2   31 1121
## [1] "Prediction matrix Postpruning decision tree"
##    pred_postprun_tr
##        1    2
##   1 1285    0
##   2    0 1152
## [1] "Prediction matrix Selected attribute model"
##    pred_select_attr
##        1    2
##   1 1274   11
##   2   64 1088
## class ~ odor + gill.size + gill.color + ring.type + spore.print.color +
##     population
## [1] "Prediction matrix Base Decision tree "
##    pred_base_tr
##        1    2
##   1 1276    0
##   2    0 1161
## [1] "Prediction matrix Preprune decision tree"
##    pred_preprun_tr
##        1    2
##   1 1265   11
##   2   52 1109
## [1] "Prediction matrix Postpruning decision tree"
##    pred_postprun_tr
##        1    2
##   1 1276    0
##   2    0 1161
## [1] "Prediction matrix Selected attribute model"
##    pred_select_attr
##        1    2
##   1 1265   11
##   2   57 1104
## class ~ odor + gill.size + gill.color + ring.type + spore.print.color +
##     population
## [1] "Prediction matrix Base Decision tree "
##    pred_base_tr
##        1    2
##   1 1242    0
##   2    0 1195
## [1] "Prediction matrix Preprune decision tree"
##    pred_preprun_tr
##        1    2
##   1 1229   13
##   2   33 1162
## [1] "Prediction matrix Postpruning decision tree"
##    pred_postprun_tr
##        1    2
##   1 1242    0
##   2    0 1195
## [1] "Prediction matrix Selected attribute model"
```

```
##    pred_select_attr
##       1    2
##   1 1229   13
##   2   66 1129
## class ~ odor + gill.size + gill.color + ring.type + spore.print.color +
##     population
## [1] "Prediction matrix Base Decision tree "
##    pred_base_tr
##       1    2
##   1 1268    0
##   2    0 1169
## [1] "Prediction matrix Preprune decision tree"
##    pred_preprun_tr
##       1    2
##   1 1257   11
##   2   37 1132
## [1] "Prediction matrix Postpruning decision tree"
##    pred_postprun_tr
##       1    2
##   1 1268    0
##   2    0 1169
## [1] "Prediction matrix Selected attribute model"
##    pred_select_attr
##       1    2
##   1 1257   11
##   2   69 1100
## class ~ odor + gill.size + gill.color + ring.type + spore.print.color +
##     population
## [1] "Prediction matrix Base Decision tree "
##    pred_base_tr
##       1    2
##   1 1233    0
##   2    0 1204
## [1] "Prediction matrix Preprune decision tree"
##    pred_preprun_tr
##       1    2
##   1 1224    9
##   2   36 1168
## [1] "Prediction matrix Postpruning decision tree"
##    pred_postprun_tr
##       1    2
##   1 1233    0
##   2    0 1204
## [1] "Prediction matrix Selected attribute model"
##    pred_select_attr
##       1    2
##   1 1224    9
##   2   75 1129
## class ~ odor + gill.size + gill.color + ring.type + spore.print.color +
##     population
## [1] "Prediction matrix Base Decision tree "
##    pred_base_tr
##       1    2
##   1 1279    0
```

```
##   2    0 1158
## [1] "Prediction matrix Preprune decision tree"
##    pred_preprun_tr
##        1    2
##   1 1269   10
##   2   50 1108
## [1] "Prediction matrix Postpruning decision tree"
##    pred_postprun_tr
##        1    2
##   1 1279    0
##   2    0 1158
## [1] "Prediction matrix Selected attribute model"
##    pred_select_attr
##        1    2
##   1 1269   10
##   2   76 1082
## class ~ odor + gill.size + gill.color + ring.type + spore.print.color +
##     population
## [1] "Prediction matrix Base Decision tree "
##    pred_base_tr
##        1    2
##   1 1264    0
##   2    0 1173
## [1] "Prediction matrix Preprune decision tree"
##    pred_preprun_tr
##        1    2
##   1 1253   11
##   2   40 1133
## [1] "Prediction matrix Postpruning decision tree"
##    pred_postprun_tr
##        1    2
##   1 1264    0
##   2    0 1173
## [1] "Prediction matrix Selected attribute model"
##    pred_select_attr
##        1    2
##   1 1253   11
##   2   65 1108
## class ~ odor + gill.size + gill.color + ring.type + spore.print.color +
##     population
## [1] "Prediction matrix Base Decision tree "
##    pred_base_tr
##        1    2
##   1 1268    0
##   2    0 1169
## [1] "Prediction matrix Preprune decision tree"
##    pred_preprun_tr
##        1    2
##   1 1255   13
##   2   39 1130
## [1] "Prediction matrix Postpruning decision tree"
##    pred_postprun_tr
##        1    2
##   1 1268    0
```

```
##   2     0 1169
## [1] "Prediction matrix Selected attribute model"
##    pred_select_attr
##        1    2
##   1 1255   13
##   2   73 1096
## class ~ odor + gill.size + gill.color + ring.type + spore.print.color +
##     population
## [1] "Prediction matrix Base Decision tree "
##    pred_base_tr
##        1    2
##   1 1241    0
##   2    0 1196
## [1] "Prediction matrix Preprune decision tree"
##    pred_preprun_tr
##        1    2
##   1 1231   10
##   2   38 1158
## [1] "Prediction matrix Postpruning decision tree"
##    pred_postprun_tr
##        1    2
##   1 1241    0
##   2    0 1196
## [1] "Prediction matrix Selected attribute model"
##    pred_select_attr
##        1    2
##   1 1231   10
##   2   64 1132
## class ~ odor + gill.size + gill.color + ring.type + spore.print.color +
##     population
## [1] "Prediction matrix Base Decision tree "
##    pred_base_tr
##        1    2
##   1 1228    0
##   2    0 1209
## [1] "Prediction matrix Preprune decision tree"
##    pred_preprun_tr
##        1    2
##   1 1222    6
##   2   36 1173
## [1] "Prediction matrix Postpruning decision tree"
##    pred_postprun_tr
##        1    2
##   1 1228    0
##   2    0 1209
## [1] "Prediction matrix Selected attribute model"
##    pred_select_attr
##        1    2
##   1 1222    6
##   2   67 1142
## class ~ odor + gill.size + gill.color + ring.type + spore.print.color +
##     population
## [1] "Prediction matrix Base Decision tree "
##    pred_base_tr
```

```
##       1    2
##   1 1265    0
##   2    0 1172
## [1] "Prediction matrix Preprune decision tree"
##    pred_preprun_tr
##       1    2
##   1 1254   11
##   2   52 1120
## [1] "Prediction matrix Postpruning decision tree"
##    pred_postprun_tr
##       1    2
##   1 1265    0
##   2    0 1172
## [1] "Prediction matrix Selected attribute model"
##    pred_select_attr
##       1    2
##   1 1254   11
##   2   70 1102
## class ~ odor + gill.size + gill.color + ring.type + spore.print.color +
##     population
## [1] "Prediction matrix Base Decision tree "
##    pred_base_tr
##       1    2
##   1 1244    0
##   2    0 1193
## [1] "Prediction matrix Preprune decision tree"
##    pred_preprun_tr
##       1    2
##   1 1232   12
##   2   37 1156
## [1] "Prediction matrix Postpruning decision tree"
##    pred_postprun_tr
##       1    2
##   1 1244    0
##   2    0 1193
## [1] "Prediction matrix Selected attribute model"
##    pred_select_attr
##       1    2
##   1 1232   12
##   2   53 1140
```

Full Tree mashroom.csv
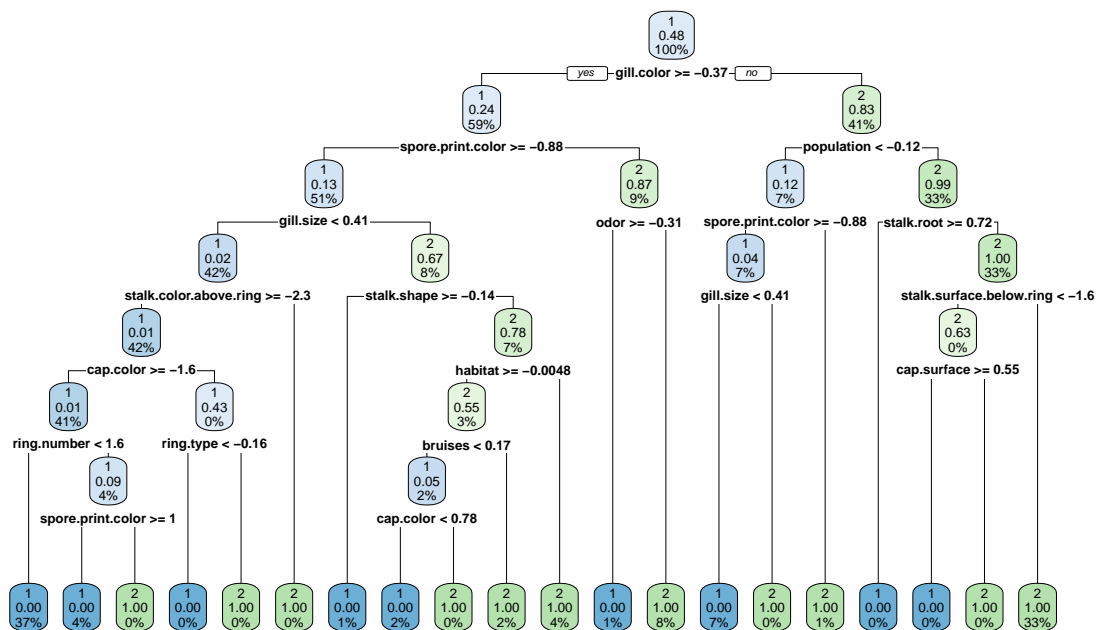
Prepruned Decision Tree mashroom.csv
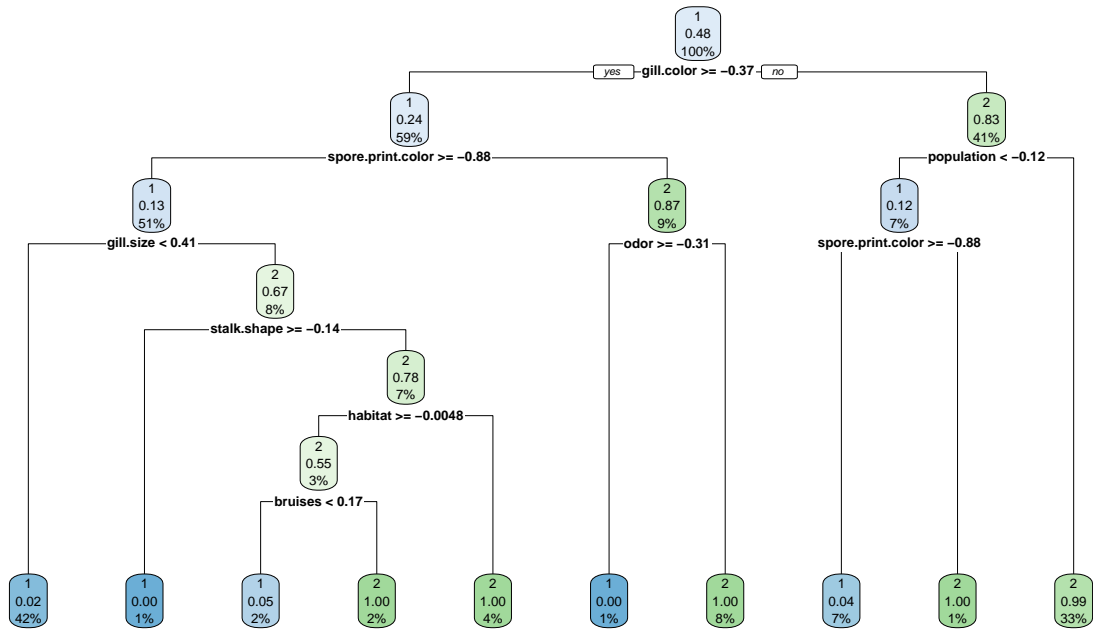
Postpruned Decision Tree mashroom.csv
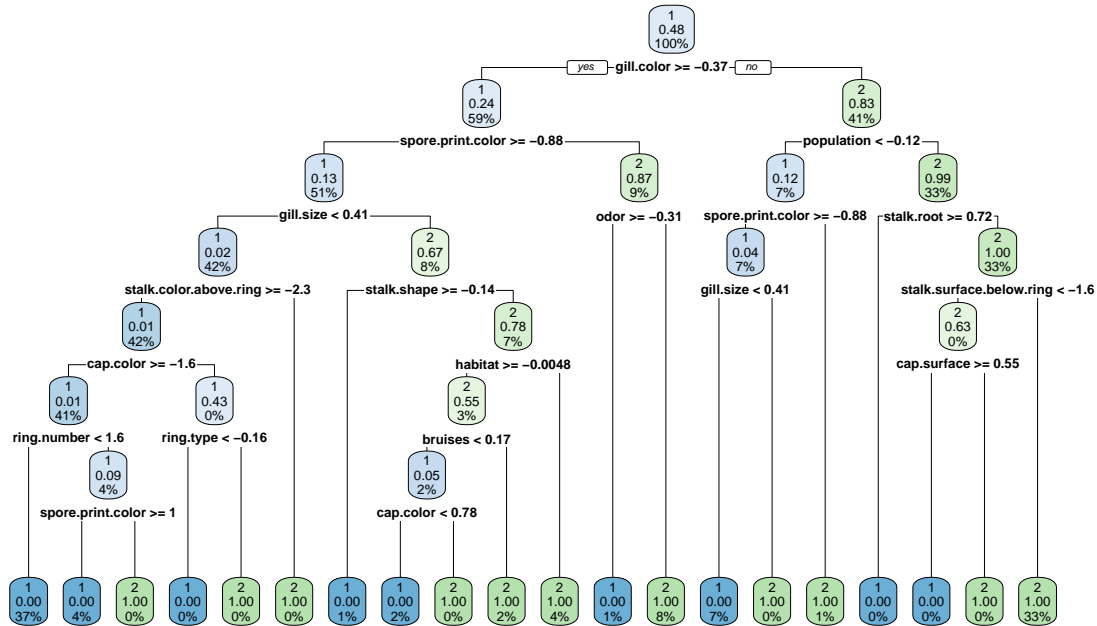

```
print(cbind(wyniki_badan1, wyniki_badan2))
```

```
##        [,1]                        [,2]
## [1,]  "abalone.csv Base accuracy" "abalone.csv Preprune accuracy"
## [2,]  "0.813"                     "0.859"
## [3,]  "0.826"                     "0.864"
## [4,]  "0.813"                     "0.868"
## [5,]  "0.817"                     "0.861"
## [6,]  "0.816"                     "0.876"
## [7,]  "0.803"                     "0.855"
## [8,]  "0.809"                     "0.861"
## [9,]  "0.791"                     "0.843"
## [10,] "0.812"                     "0.852"
## [11,] "0.831"                     "0.87"
## [12,] "0.804"                     "0.862"
## [13,] "0.798"                     "0.848"
## [14,] "0.789"                     "0.848"
## [15,] "0.809"                     "0.867"
## [16,] "0.84"                      "0.861"
## [17,] "0.821"                     "0.866"
## [18,] "0.807"                     "0.856"
## [19,] "0.821"                     "0.866"
## [20,] "0.825"                     "0.855"
## [21,] "0.819"                     "0.86"
## [22,] "0.82"                      "0.847"
```

```
## [23,] "0.803"                    "0.859"
## [24,] "0.8"                      "0.866"
## [25,] "0.817"                    "0.871"
## [26,] "0.813"                    "0.851"
## [27,] "0.84"                     "0.876"
## [28,] "0.791"                    "0.847"
## [29,] "0.801"                    "0.856"
## [30,] "0.829"                    "0.862"
## [31,] "0.829"                    "0.864"
##        [,3]                       [,4]
##  [1,] "adult.csv Base accuracy" "adult.csv Preprune accuracy"
##  [2,] "0.793"                    "0.835"
##  [3,] "0.802"                    "0.842"
##  [4,] "0.811"                    "0.838"
##  [5,] "0.805"                    "0.844"
##  [6,] "0.806"                    "0.844"
##  [7,] "0.802"                    "0.841"
##  [8,] "0.802"                    "0.839"
##  [9,] "0.801"                    "0.842"
## [10,] "0.805"                    "0.84"
## [11,] "0.803"                    "0.845"
## [12,] "0.806"                    "0.845"
## [13,] "0.804"                    "0.842"
## [14,] "0.809"                    "0.841"
## [15,] "0.8"                      "0.834"
## [16,] "0.806"                    "0.84"
## [17,] "0.802"                    "0.844"
## [18,] "0.797"                    "0.833"
## [19,] "0.805"                    "0.838"
## [20,] "0.805"                    "0.834"
## [21,] "0.799"                    "0.837"
## [22,] "0.804"                    "0.838"
## [23,] "0.809"                    "0.843"
## [24,] "0.797"                    "0.838"
## [25,] "0.811"                    "0.84"
## [26,] "0.798"                    "0.837"
## [27,] "0.803"                    "0.835"
## [28,] "0.802"                    "0.841"
## [29,] "0.809"                    "0.838"
## [30,] "0.798"                    "0.837"
## [31,] "0.807"                    "0.836"
##        [,5]                       [,6]
##  [1,] "bank.csv Base accuracy"  "bank.csv Preprune accuracy"
##  [2,] "0.854"                    "0.891"
##  [3,] "0.855"                    "0.892"
##  [4,] "0.85"                     "0.897"
##  [5,] "0.864"                    "0.887"
##  [6,] "0.863"                    "0.891"
##  [7,] "0.863"                    "0.907"
##  [8,] "0.873"                    "0.898"
##  [9,] "0.864"                    "0.879"
## [10,] "0.873"                    "0.894"
## [11,] "0.872"                    "0.887"
## [12,] "0.861"                    "0.889"
```

```
## [13,] "0.863"                 "0.898"
## [14,] "0.859"                 "0.909"
## [15,] "0.862"                 "0.903"
## [16,] "0.856"                 "0.885"
## [17,] "0.87"                  "0.891"
## [18,] "0.857"                 "0.885"
## [19,] "0.868"                 "0.884"
## [20,] "0.863"                 "0.898"
## [21,] "0.875"                 "0.901"
## [22,] "0.866"                 "0.889"
## [23,] "0.867"                 "0.896"
## [24,] "0.86"                  "0.901"
## [25,] "0.862"                 "0.897"
## [26,] "0.884"                 "0.895"
## [27,] "0.874"                 "0.908"
## [28,] "0.856"                 "0.89"
## [29,] "0.861"                 "0.902"
## [30,] "0.863"                 "0.893"
## [31,] "0.847"                 "0.883"
##       [,7]                      [,8]
##  [1,] "mashroom.csv Base accuracy" "mashroom.csv Preprune accuracy"
##  [2,] "1"                       "0.984"
##  [3,] "1"                       "0.981"
##  [4,] "1"                       "0.979"
##  [5,] "1"                       "0.969"
##  [6,] "1"                       "0.972"
##  [7,] "1"                       "0.979"
##  [8,] "1"                       "0.98"
##  [9,] "1"                       "0.985"
## [10,] "1"                       "0.982"
## [11,] "1"                       "0.989"
## [12,] "1"                       "0.983"
## [13,] "1"                       "0.989"
## [14,] "1"                       "0.982"
## [15,] "1"                       "0.986"
## [16,] "0.999"                   "0.977"
## [17,] "1"                       "0.978"
## [18,] "0.999"                   "0.98"
## [19,] "1"                       "0.98"
## [20,] "1"                       "0.983"
## [21,] "1"                       "0.974"
## [22,] "1"                       "0.981"
## [23,] "1"                       "0.98"
## [24,] "1"                       "0.982"
## [25,] "1"                       "0.975"
## [26,] "1"                       "0.979"
## [27,] "1"                       "0.979"
## [28,] "1"                       "0.98"
## [29,] "1"                       "0.983"
## [30,] "1"                       "0.974"
## [31,] "1"                       "0.98"
##       [,9]                        [,10]
##  [1,] "abalone.csv Postprune accuracy" "abalone.csv Attribute selction"
##  [2,] "0.862"                     "0.853"
```

```
##  [3,] "0.868"                       "0.861"
##  [4,] "0.859"                       "0.872"
##  [5,] "0.859"                       "0.845"
##  [6,] "0.873"                       "0.862"
##  [7,] "0.852"                       "0.855"
##  [8,] "0.861"                       "0.864"
##  [9,] "0.84"                        "0.844"
## [10,] "0.857"                       "0.848"
## [11,] "0.866"                       "0.864"
## [12,] "0.863"                       "0.857"
## [13,] "0.852"                       "0.844"
## [14,] "0.848"                       "0.842"
## [15,] "0.86"                        "0.864"
## [16,] "0.867"                       "0.855"
## [17,] "0.868"                       "0.865"
## [18,] "0.857"                       "0.854"
## [19,] "0.871"                       "0.868"
## [20,] "0.855"                       "0.854"
## [21,] "0.86"                        "0.858"
## [22,] "0.847"                       "0.843"
## [23,] "0.859"                       "0.847"
## [24,] "0.866"                       "0.855"
## [25,] "0.874"                       "0.86"
## [26,] "0.864"                       "0.856"
## [27,] "0.873"                       "0.872"
## [28,] "0.844"                       "0.843"
## [29,] "0.868"                       "0.852"
## [30,] "0.863"                       "0.87"
## [31,] "0.866"                       "0.865"
##       [,11]                         [,12]
##  [1,] "adult.csv Postprune accuracy" "adult.csv Attribute selction"
##  [2,] "0.847"                       "0.793"
##  [3,] "0.851"                       "0.797"
##  [4,] "0.852"                       "0.793"
##  [5,] "0.853"                       "0.795"
##  [6,] "0.849"                       "0.807"
##  [7,] "0.847"                       "0.8"
##  [8,] "0.851"                       "0.791"
##  [9,] "0.854"                       "0.8"
## [10,] "0.852"                       "0.796"
## [11,] "0.855"                       "0.799"
## [12,] "0.853"                       "0.799"
## [13,] "0.855"                       "0.801"
## [14,] "0.851"                       "0.798"
## [15,] "0.849"                       "0.791"
## [16,] "0.85"                        "0.799"
## [17,] "0.859"                       "0.801"
## [18,] "0.849"                       "0.793"
## [19,] "0.851"                       "0.799"
## [20,] "0.848"                       "0.794"
## [21,] "0.851"                       "0.797"
## [22,] "0.851"                       "0.802"
## [23,] "0.858"                       "0.794"
## [24,] "0.848"                       "0.793"
```

```
## [25,] "0.851"                          "0.8"
## [26,] "0.851"                          "0.797"
## [27,] "0.845"                          "0.789"
## [28,] "0.851"                          "0.795"
## [29,] "0.85"                           "0.796"
## [30,] "0.85"                           "0.798"
## [31,] "0.85"                           "0.793"
##       [,13]                       [,14]
##  [1,] "bank.csv Postprune accuracy" "bank.csv Attribute selction"
##  [2,] "0.891"                     "0.89"
##  [3,] "0.894"                     "0.901"
##  [4,] "0.897"                     "0.9"
##  [5,] "0.889"                     "0.887"
##  [6,] "0.891"                     "0.899"
##  [7,] "0.909"                     "0.903"
##  [8,] "0.895"                     "0.901"
##  [9,] "0.881"                     "0.886"
## [10,] "0.892"                     "0.898"
## [11,] "0.887"                     "0.888"
## [12,] "0.89"                      "0.883"
## [13,] "0.899"                     "0.898"
## [14,] "0.91"                      "0.908"
## [15,] "0.903"                     "0.897"
## [16,] "0.884"                     "0.883"
## [17,] "0.889"                     "0.893"
## [18,] "0.881"                     "0.891"
## [19,] "0.887"                     "0.893"
## [20,] "0.893"                     "0.896"
## [21,] "0.906"                     "0.906"
## [22,] "0.889"                     "0.9"
## [23,] "0.898"                     "0.898"
## [24,] "0.9"                       "0.908"
## [25,] "0.899"                     "0.9"
## [26,] "0.895"                     "0.899"
## [27,] "0.906"                     "0.906"
## [28,] "0.889"                     "0.895"
## [29,] "0.896"                     "0.902"
## [30,] "0.893"                     "0.901"
## [31,] "0.885"                     "0.887"
##       [,15]                          [,16]
##  [1,] "mashroom.csv Postprune accuracy" "mashroom.csv Attribute selction"
##  [2,] "1"                            "0.977"
##  [3,] "1"                            "0.969"
##  [4,] "1"                            "0.969"
##  [5,] "1"                            "0.965"
##  [6,] "1"                            "0.972"
##  [7,] "1"                            "0.975"
##  [8,] "1"                            "0.969"
##  [9,] "1"                            "0.972"
## [10,] "1"                            "0.972"
## [11,] "1"                            "0.975"
## [12,] "1"                            "0.979"
## [13,] "1"                            "0.974"
## [14,] "1"                            "0.966"
```

```
## [15,] "1"                              "0.971"
## [16,] "0.999"                          "0.974"
## [17,] "1"                              "0.966"
## [18,] "0.996"                          "0.968"
## [19,] "1"                              "0.967"
## [20,] "1"                              "0.969"
## [21,] "1"                              "0.972"
## [22,] "1"                              "0.968"
## [23,] "1"                              "0.967"
## [24,] "1"                              "0.966"
## [25,] "1"                              "0.965"
## [26,] "1"                              "0.969"
## [27,] "1"                              "0.965"
## [28,] "1"                              "0.97"
## [29,] "1"                              "0.97"
## [30,] "1"                              "0.967"
## [31,] "1"                              "0.973"
```

```r
print(podsumowenia_wynikow)
```

```
##        Dataset name    Base accuracy Preprune accuracy Postprune accuracy
## [1,] "abalone.csv"  "81.3 %"      "85.98 %"         "86.06 %"
## [2,] "adult.csv"    "80.32 %"     "83.95 %"         "85.11 %"
## [3,] "bank.csv"     "86.41 %"     "89.44 %"         "89.42 %"
## [4,] "mashroom.csv" "99.99 %"     "98.02 %"         "99.98 %"
##        Attribute selction
## [1,] "85.61 %"
## [2,] "79.68 %"
## [3,] "89.69 %"
## [4,] "96.99 %"
```

#Analiza wyników oraz wnioski W ramach danego projektu byli zastosowane następne metody zwiększenia wydajności działania klasyfikatora drzew decyzyjnych: algorytmy przecinania drzewa przez funkcję „repart", selekcja atrybutów .Dla sprawdzenia działalności danych metod było zastosowane podejście obliczenia błędu klasyfikacji. Dla analizy były wykorzystane 4 zbiory danych : Adult.csv, Bank.csv,Abalone.csv, Mashroom.csv. Otrzymane wyniki udowodniają zwiększenie wydajności klasyfikatora przez metody przecinania drzewa decyzji . Pierwsza metoda obcinania drzewa polega na wprowadzeniu do funkcji rpart parametru kontroli rozszerzenia drzewa decyzji . Aby poprawić działalność klasyfikatora możemy na-rzucić ograniczenia na rozbudowę drzewa za pomocą parametru kontroli poprzez określenie minimalnej liczby elementów w liściu za pomocą parametru minsplit , maksymalnej wysokości drzewa przez parametr maxdepth , minimalnej ilości obserwacji w „liściach" drzewa za pomocą parametru minbucket. Inną metodą przecinania drzewa jest dopasowanie wskaźnika złożoności cp. W porównaniu do metod obcięcia drzewa decyzji, metoda selekcji atrybutów istotnych działa gorzej.