Experiment_with_data

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Problem statement

In this problem, we have to classify the "Income.Group" based on the predictors. We use rpart classifiers to classify the dataset.

Load the library

```
suppressMessages(library(caret))
suppressMessages(library(doParallel))
suppressMessages(library(Hmisc))
library(data.table)
```

Data loading and exploration

We load the data from given urls. Our goal is to predict the Income.Group for testData and we prepare our model on Vehicle dataset.

```
cl <- makeCluster(detectCores())
registerDoParallel(cl)

#fileUrlTrain <- "https://datahack-prod.s3.ap-south-1.amazonaws.com/workshop_train_file/train_gbW7HTd.c
#download.file(fileUrlTrain,destfile = "./fileTrain.csv")
Vehicle <- read.csv("fileTrain.csv",header=T,na.strings = "")

#fileUrlTest <- "https://datahack-prod.s3.ap-south-1.amazonaws.com/workshop_test_file/test_2AFBew7.csv"
#download.file(fileUrlTest,destfile = "./fileTest.csv")
testData <- read.csv("fileTest.csv",header = T,na.strings = "")
```

Data Cleaning

We convert the Income.Group value (if it is "<=50K" it gives X0 otherwise it gives X1)

```
names(Vehicle) <- gsub("[.]","_",names(Vehicle))
names(testData) <- gsub("[.]","_",names(testData))
Vehicle$Income_Group <- factor(ifelse(Vehicle$Income_Group=="<=50K",0,1))
Vehicle$Income_Group <- make.names(Vehicle$Income_Group)
Vehicle$Income_Group <- factor(Vehicle$Income_Group)
```

Data Visualization

Classes in the response variable is unbalanced. Hence sampling is need to get the good accuracy.

```
str(Vehicle)
```

```
## 'data.frame':    32561 obs. of  12 variables:
##  $ ID            : int  1 2 3 4 5 6 7 8 9 10 ...
##  $ Age           : int  39 50 38 53 28 37 49 52 31 42 ...
##  $ Workclass     : Factor w/ 8 levels "Federal-gov",..: 7 6 4 4 4 4 4 6 4 4 ...
##  $ Education     : Factor w/ 16 levels "10th","11th",..: 10 10 12 2 10 13 7 12 13 10 ...
##  $ Marital_Status: Factor w/ 7 levels "Divorced","Married-AF-spouse",..: 5 3 1 3 3 3 4 3 5 3 ...
##  $ Occupation    : Factor w/ 14 levels "Adm-clerical",..: 1 4 6 6 10 4 8 4 10 4 ...
##  $ Relationship  : Factor w/ 6 levels "Husband","Not-in-family",..: 2 1 2 1 6 6 2 1 2 1 ...
##  $ Race          : Factor w/ 5 levels "Amer-Indian-Eskimo",..: 5 5 5 3 3 5 3 5 5 5 ...
##  $ Sex           : Factor w/ 2 levels "Female","Male": 2 2 2 2 1 1 1 2 1 2 ...
##  $ Hours_Per_Week: int  40 13 40 40 40 40 16 45 50 40 ...
##  $ Native_Country: Factor w/ 41 levels "Cambodia","Canada",..: 39 39 39 39 5 39 23 39 39 39 ...
##  $ Income_Group  : Factor w/ 2 levels "X0","X1": 1 1 1 1 1 1 1 2 2 2 ...
```

```
table(Vehicle$Income_Group)
```

```
##
##    X0    X1
## 24720  7841
```

```
prop.table(table(Vehicle$Income_Group))
```

```
##
##        X0        X1
## 0.7591904 0.2408096
```

Missing value detection and treatment

We replaced missing value to the value which occurs frequently in that predictor

```
colSums(is.na(Vehicle))
```

```
##             ID            Age      Workclass      Education Marital_Status
##              0              0           1836              0              0
##     Occupation   Relationship           Race            Sex Hours_Per_Week
##           1843              0              0              0              0
## Native_Country   Income_Group
##            583              0
```

```
Vehicle$Workclass <- impute(Vehicle$Workclass,mode)
Vehicle$Occupation <- impute(Vehicle$Occupation,mode)
Vehicle$Native_Country <- impute(Vehicle$Native_Country,mode)
```

Create train and test data

```
index <- createDataPartition(Vehicle$Income_Group,p=0.7,list=FALSE)
training <- Vehicle[index,]
testing <- Vehicle[-index,]
```

Model Building

```
ctrl <- trainControl(method="repeatedcv",
                     repeats = 10,
```

```
                     classProbs = T,
                     sampling = "up",
                     allowParallel = TRUE,
                     summaryFunction = twoClassSummary
)

rpart_mod <- train(Income_Group ~ .,
                   data=training,
                   method="rpart",
                   trControl=ctrl,
                   tuneLength=30,
                   metric="ROC",
                   na.action = na.omit
)
```

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

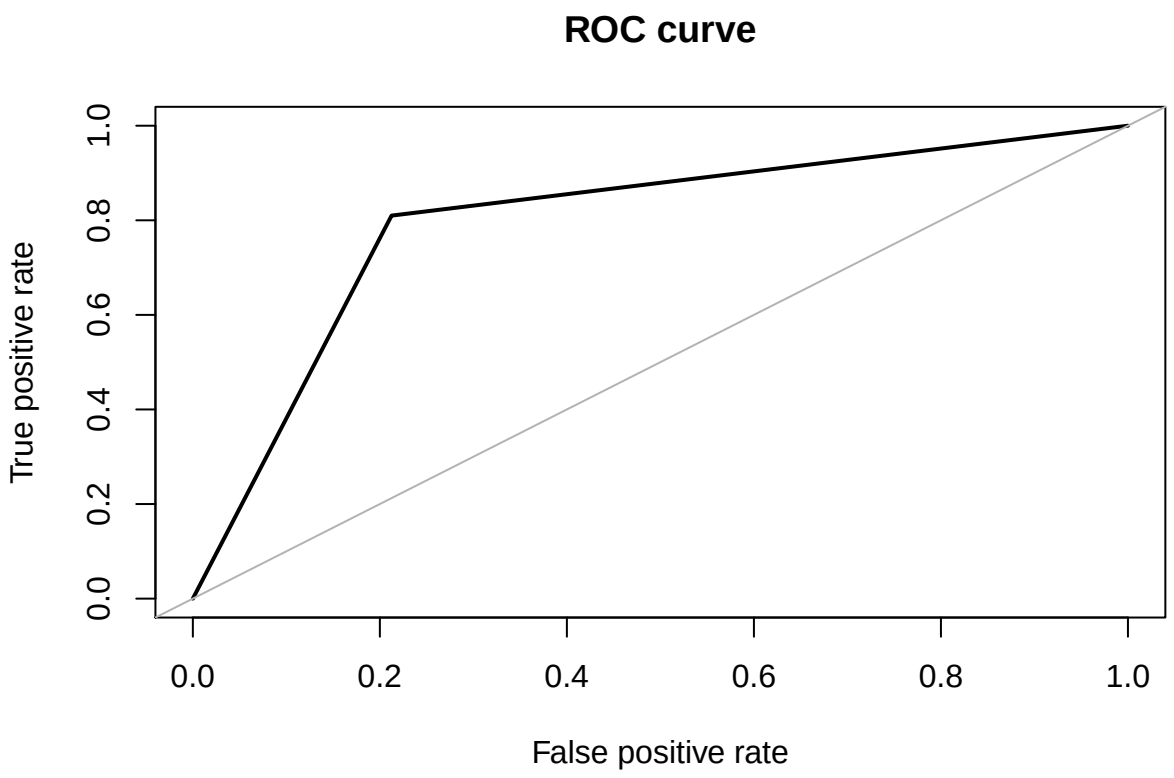
Prediction for training data

```
predicted <- predict(rpart_mod,testing)
caret::confusionMatrix(predicted,testing$Income_Group)
```

```
## Confusion Matrix and Statistics
##
##           Reference
## Prediction   X0   X1
##         X0 5840  447
##         X1 1576 1905
##
##                Accuracy : 0.7929
##                  95% CI : (0.7847, 0.8009)
##     No Information Rate : 0.7592
##     P-Value [Acc > NIR] : 1.341e-15
##
##                   Kappa : 0.5133
##  Mcnemar's Test P-Value : < 2.2e-16
##
##             Sensitivity : 0.7875
##             Specificity : 0.8099
##          Pos Pred Value : 0.9289
##          Neg Pred Value : 0.5473
##              Prevalence : 0.7592
##          Detection Rate : 0.5979
##    Detection Prevalence : 0.6436
##       Balanced Accuracy : 0.7987
##
##        'Positive' Class : X0
##
```

ROC

```
suppressMessages(library(ROSE))
roc.curve(testing$Income_Group,predicted)
```




```
## Area under the curve (AUC): 0.799
```

Prediction for testData

```
# predicted <- ifelse(predicted == "XO","<=50K",">50K")
# df <- data.frame(ID = testData$ID,Income.Group=predicted)
# write.csv(df,file = "final_solutions.csv")
```