R Notebook

Parametros:

Measure = Area under the curve
Columns = sampling, weight_space, underbagging, learner
Performance = holdout_measure
Filter keys = NULL
Filter values = NULL

```
library("scmamp")
library(dplyr)
```

Tratamento dos dados

Carregando data set compilado

```
ds = read.csv("/home/rodrigo/Dropbox/UNICAMP/IC/estudo_cost_learning/SummaryResults/summary_compilation_

ds = filter(ds, learner != "classif.rusboost")
summary(ds)
```

```
##                   learner      weight_space
##  classif.ksvm        :17100   Mode :logical
##  classif.randomForest:17100   FALSE:41040
##  classif.rusboost    :    0   TRUE :10260
##  classif.xgboost     :17100   NA's :0
##
##
##
##                               measure        sampling     underbagging
##  Accuracy                        :10260   ADASYN:10260   Mode :logical
##  Area under the curve            :10260   FALSE :30780   FALSE:41040
##  F1 measure                      :10260   SMOTE :10260   TRUE :10260
##  G-mean                          :10260                  NA's :0
##  Matthews correlation coefficient:10260
##
##
##  tuning_measure    holdout_measure   holdout_measure_residual
##  Min.   :-0.1277   Min.   :-0.2120   Min.   :-0.4658
##  1st Qu.: 0.6911   1st Qu.: 0.4001   1st Qu.: 0.1994
##  Median : 0.9700   Median : 0.8571   Median : 0.5581
##  Mean   : 0.7903   Mean   : 0.6718   Mean   : 0.5298
##  3rd Qu.: 0.9975   3rd Qu.: 0.9900   3rd Qu.: 0.8755
##  Max.   : 1.0000   Max.   : 1.0000   Max.   : 1.0000
##  NA's   :1077      NA's   :1077      NA's   :1077
##  iteration_count                      dataset         imba.rate
##  Min.   :1       abalone                    :  900   Min.   :0.0010
##  1st Qu.:1       adult                      :  900   1st Qu.:0.0100
##  Median :2       bank                       :  900   Median :0.0300
##  Mean   :2       car                        :  900   Mean   :0.0286
##  3rd Qu.:3       cardiotocography-10clases:  900   3rd Qu.:0.0500
##  Max.   :3       cardiotocography-3clases :  900   Max.   :0.0500
##  NA's   :1077    (Other)                  :45900
```

Filtrando pela metrica

```
ds = filter(ds, measure == params$measure)
```

Filtrando o data set

```
if(params$filter_keys != 'NULL' && !is.null(params$filter_keys)){
  ds = filter_at(ds, .vars = params$filter_keys, .vars_predicate = any_vars(. == params$filter_values))
}

summary(ds)
```

```
##                   learner     weight_space
##  classif.ksvm        :3420   Mode :logical
##  classif.randomForest:3420   FALSE:8208
##  classif.rusboost    :   0   TRUE :2052
##  classif.xgboost     :3420   NA's :0
##
##
##
##                                measure        sampling    underbagging
##  Accuracy                        :    0   ADASYN:2052   Mode :logical
##  Area under the curve            :10260   FALSE :6156   FALSE:8208
##  F1 measure                      :    0   SMOTE :2052   TRUE :2052
##  G-mean                          :    0                 NA's :0
##  Matthews correlation coefficient:    0
##
##
##  tuning_measure   holdout_measure  holdout_measure_residual
##  Min.   :0.3023   Min.   :0.0000   Min.   :0.0000
##  1st Qu.:0.9325   1st Qu.:0.8620   1st Qu.:0.7067
##  Median :0.9967   Median :0.9831   Median :0.8932
##  Mean   :0.9380   Mean   :0.8972   Mean   :0.8310
##  3rd Qu.:1.0000   3rd Qu.:0.9999   3rd Qu.:0.9819
##  Max.   :1.0000   Max.   :1.0000   Max.   :1.0000
##  NA's   :243      NA's   :243      NA's   :243
##  iteration_count                      dataset       imba.rate
##  Min.   :1       abalone                   : 180   Min.   :0.0010
##  1st Qu.:1       adult                     : 180   1st Qu.:0.0100
##  Median :2       bank                      : 180   Median :0.0300
##  Mean   :2       car                       : 180   Mean   :0.0286
##  3rd Qu.:3       cardiotocography-10clases: 180   3rd Qu.:0.0500
##  Max.   :3       cardiotocography-3clases : 180   Max.   :0.0500
##  NA's   :243     (Other)                  :9180
```

Computando as médias das iteracoes

```
ds = group_by(ds, learner , weight_space , measure , sampling , underbagging , dataset , imba.rate)
ds = summarise(ds, tuning_measure = mean(tuning_measure), holdout_measure = mean(holdout_measure),
               holdout_measure_residual = mean(holdout_measure_residual))

ds = as.data.frame(ds)
```

Criando dataframe

```
# Dividindo o ds em n, um para cada técnica
splited_df = ds %>% group_by_at(.vars = params$columns) %>% do(vals = as.data.frame(.)) %>% select(vals

# Juntando cada uma das partes horizontalmente em um data set
df_tec_wide = do.call("cbind", splited_df)

# Renomeando duplicacao de nomes
colnames(df_tec_wide) = make.unique(colnames(df_tec_wide))

# Selecionando apenas as medidas da performance escolhida
df_tec_wide_residual = select(df_tec_wide, matches(paste("^", params$performance, "$|", params$performan

# Renomeando colunas
new_names = NULL
for(i in (1:length(splited_df))){
  id = toString(sapply(splited_df[[i]][1, params$columns], as.character))
  new_names = c(new_names, id)
}
colnames(df_tec_wide_residual) = new_names

# Verificando a dimensao do df
dim(df_tec_wide_residual)
```

```
## [1] 228  15
```

```
# Renomeando a variavel
df = df_tec_wide_residual

summary(df)
```

```
##  ADASYN, FALSE, FALSE, classif.ksvm
##  Min.   :0.3593
##  1st Qu.:0.7152
##  Median :0.8995
##  Mean   :0.8476
##  3rd Qu.:0.9922
##  Max.   :1.0000
##  NA's   :14
##  ADASYN, FALSE, FALSE, classif.randomForest
##  Min.   :0.3435
##  1st Qu.:0.8856
##  Median :0.9818
##  Mean   :0.9241
##  3rd Qu.:0.9993
##  Max.   :1.0000
##  NA's   :20
##  ADASYN, FALSE, FALSE, classif.xgboost FALSE, FALSE, FALSE, classif.ksvm
##  Min.   :0.4176                        Min.   :0.3333
##  1st Qu.:0.8854                        1st Qu.:0.7141
##  Median :0.9783                        Median :0.9436
##  Mean   :0.9158                        Mean   :0.8470
##  3rd Qu.:0.9990                        3rd Qu.:0.9983
##  Max.   :1.0000                        Max.   :1.0000
##                                        NA's   :5
##  FALSE, FALSE, FALSE, classif.randomForest
##  Min.   :0.2924
##  1st Qu.:0.9067
##  Median :0.9872
##  Mean   :0.9220
##  3rd Qu.:0.9998
##  Max.   :1.0000
##  NA's   :4
##  FALSE, FALSE, FALSE, classif.xgboost FALSE, FALSE, TRUE, classif.ksvm
##  Min.   :0.4439                       Min.   :0.4413
##  1st Qu.:0.9049                       1st Qu.:0.7752
##  Median :0.9834                       Median :0.8783
##  Mean   :0.9298                       Mean   :0.8478
##  3rd Qu.:0.9995                       3rd Qu.:0.9648
##  Max.   :1.0000                       Max.   :1.0000
##
##  FALSE, FALSE, TRUE, classif.randomForest
##  Min.   :0.5018
##  1st Qu.:0.8917
##  Median :0.9808
##  Mean   :0.9194
##  3rd Qu.:0.9977
##  Max.   :1.0000
##  NA's   :6
##  FALSE, FALSE, TRUE, classif.xgboost FALSE, TRUE, FALSE, classif.ksvm
##  Min.   :0.4469                      Min.   :0.3333
##  1st Qu.:0.8885                      1st Qu.:0.7141
##  Median :0.9743                      Median :0.9427
##  Mean   :0.9170                      Mean   :0.8447
##  3rd Qu.:0.9968                      3rd Qu.:0.9983
##  Max.   :1.0000                      Max.   :1.0000
##                                      NA's   :5
##  FALSE, TRUE, FALSE, classif.randomForest
##  Min.   :0.3369
##  1st Qu.:0.9096
##  Median :0.9870
##  Mean   :0.9242
##  3rd Qu.:0.9997
##  Max.   :1.0000
##  NA's   :9
##  FALSE, TRUE, FALSE, classif.xgboost SMOTE, FALSE, FALSE, classif.ksvm
##  Min.   :0.3793                      Min.   :0.2679
##  1st Qu.:0.9013                      1st Qu.:0.7202
##  Median :0.9831                      Median :0.9052
##  Mean   :0.9274                      Mean   :0.8402
##  3rd Qu.:0.9996                      3rd Qu.:0.9920
##  Max.   :1.0000                      Max.   :1.0000
##                                      NA's   :5
##  SMOTE, FALSE, FALSE, classif.randomForest
##  Min.   :0.4685
##  1st Qu.:0.9052
##  Median :0.9896
##  Mean   :0.9298
##  3rd Qu.:0.9997
##  Max.   :1.0000
##  NA's   :13
##  SMOTE, FALSE, FALSE, classif.xgboost
##  Min.   :0.3896
##  1st Qu.:0.8983
##  Median :0.9860
##  Mean   :0.9213
##  3rd Qu.:0.9994
##  Max.   :1.0000
##
```

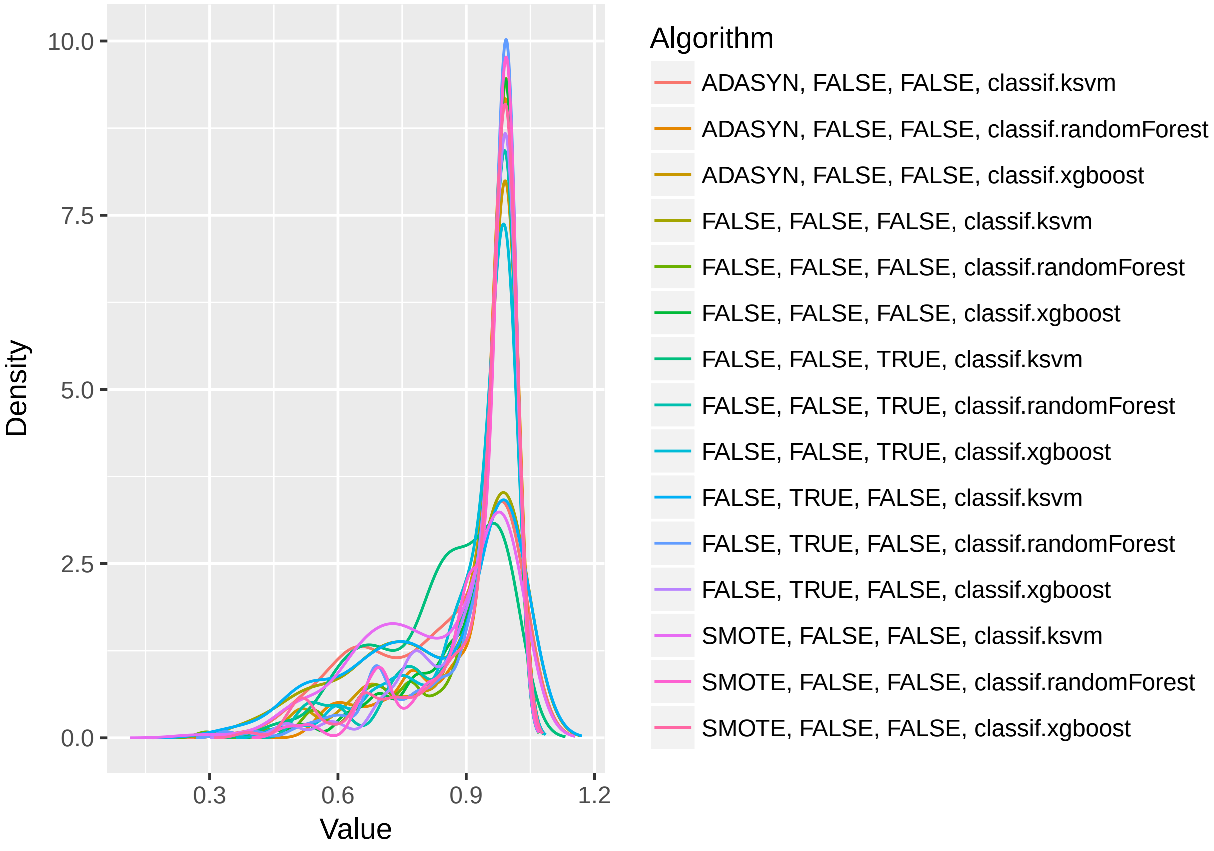
Verificando a média de cada coluna selecionada

```
for(i in (1:dim(df)[2])){
  #print(df[,i])
  print(paste("Media da coluna ", colnames(df)[i], " = ", mean(df[,i], na.rm = TRUE), sep=""))
}
```

```
## [1] "Media da coluna ADASYN, FALSE, FALSE, classif.ksvm = 0.847600975288232"
## [1] "Media da coluna ADASYN, FALSE, FALSE, classif.randomForest = 0.924075196327091"
## [1] "Media da coluna ADASYN, FALSE, FALSE, classif.xgboost = 0.915784354960603"
## [1] "Media da coluna FALSE, FALSE, FALSE, classif.ksvm = 0.846954376991967"
## [1] "Media da coluna FALSE, FALSE, FALSE, classif.randomForest = 0.922012773476355"
## [1] "Media da coluna FALSE, FALSE, FALSE, classif.xgboost = 0.929783475298908"
## [1] "Media da coluna FALSE, FALSE, TRUE, classif.ksvm = 0.847805556989247"
## [1] "Media da coluna FALSE, FALSE, TRUE, classif.randomForest = 0.919399133478833"
## [1] "Media da coluna FALSE, FALSE, TRUE, classif.xgboost = 0.917034287580282"
## [1] "Media da coluna FALSE, TRUE, FALSE, classif.ksvm = 0.84467330893257"
## [1] "Media da coluna FALSE, TRUE, FALSE, classif.randomForest = 0.924221926965532"
## [1] "Media da coluna FALSE, TRUE, FALSE, classif.xgboost = 0.927399939339536"
## [1] "Media da coluna SMOTE, FALSE, FALSE, classif.ksvm = 0.840218688802973"
## [1] "Media da coluna SMOTE, FALSE, FALSE, classif.randomForest = 0.92982450763708"
## [1] "Media da coluna SMOTE, FALSE, FALSE, classif.xgboost = 0.921273412559642"
```

Fazendo teste de normalidade

```
plotDensities(data = na.omit(df))
```



Testando as diferencas

```
friedmanTest(df)
```

```
##
##  Friedman's rank sum test
##
## data:  df
## Friedman's chi-squared = 588.22, df = 14, p-value < 2.2e-16
```

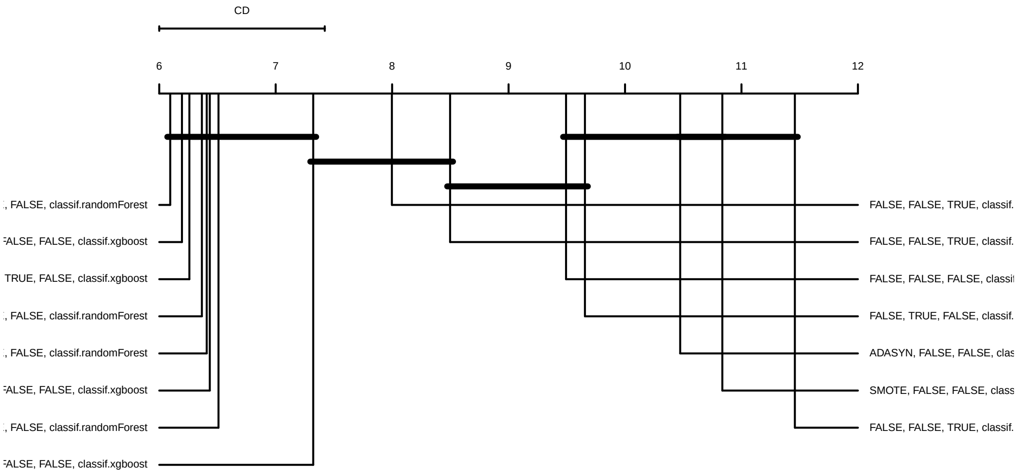
Testando as diferencas par a par

```
test <- nemenyiTest (df, alpha=0.05)
abs(test$diff.matrix) > test$statistic
```

```
##       ADASYN, FALSE, FALSE, classif.ksvm
##  [1,]                              FALSE
##  [2,]                               TRUE
##  [3,]                               TRUE
##  [4,]                              FALSE
##  [5,]                               TRUE
##  [6,]                               TRUE
##  [7,]                              FALSE
##  [8,]                               TRUE
##  [9,]                               TRUE
## [10,]                              FALSE
## [11,]                               TRUE
## [12,]                               TRUE
## [13,]                              FALSE
## [14,]                               TRUE
## [15,]                               TRUE
##       ADASYN, FALSE, FALSE, classif.randomForest
##  [1,]                                       TRUE
##  [2,]                                      FALSE
##  [3,]                                      FALSE
##  [4,]                                       TRUE
##  [5,]                                      FALSE
##  [6,]                                      FALSE
##  [7,]                                       TRUE
##  [8,]                                       TRUE
##  [9,]                                       TRUE
## [10,]                                       TRUE
## [11,]                                      FALSE
## [12,]                                      FALSE
## [13,]                                       TRUE
## [14,]                                      FALSE
## [15,]                                      FALSE
##       ADASYN, FALSE, FALSE, classif.xgboost
##  [1,]                                  TRUE
##  [2,]                                 FALSE
##  [3,]                                 FALSE
##  [4,]                                  TRUE
##  [5,]                                 FALSE
##  [6,]                                 FALSE
##  [7,]                                  TRUE
##  [8,]                                 FALSE
##  [9,]                                 FALSE
## [10,]                                  TRUE
## [11,]                                 FALSE
## [12,]                                 FALSE
## [13,]                                  TRUE
## [14,]                                 FALSE
## [15,]                                 FALSE
##       FALSE, FALSE, FALSE, classif.ksvm
##  [1,]                             FALSE
##  [2,]                              TRUE
##  [3,]                              TRUE
##  [4,]                             FALSE
##  [5,]                              TRUE
##  [6,]                              TRUE
##  [7,]                              TRUE
##  [8,]                              TRUE
##  [9,]                             FALSE
## [10,]                             FALSE
## [11,]                              TRUE
## [12,]                              TRUE
## [13,]                             FALSE
## [14,]                              TRUE
## [15,]                              TRUE
##       FALSE, FALSE, FALSE, classif.randomForest
##  [1,]                                      TRUE
##  [2,]                                     FALSE
##  [3,]                                     FALSE
##  [4,]                                      TRUE
##  [5,]                                     FALSE
##  [6,]                                     FALSE
##  [7,]                                      TRUE
##  [8,]                                      TRUE
##  [9,]                                      TRUE
## [10,]                                      TRUE
## [11,]                                     FALSE
## [12,]                                     FALSE
## [13,]                                      TRUE
## [14,]                                     FALSE
## [15,]                                     FALSE
##       FALSE, FALSE, FALSE, classif.xgboost
##  [1,]                                 TRUE
##  [2,]                                FALSE
##  [3,]                                FALSE
##  [4,]                                 TRUE
##  [5,]                                FALSE
##  [6,]                                FALSE
##  [7,]                                 TRUE
##  [8,]                                 TRUE
##  [9,]                                 TRUE
## [10,]                                 TRUE
## [11,]                                FALSE
## [12,]                                FALSE
## [13,]                                 TRUE
## [14,]                                FALSE
## [15,]                                FALSE
##       FALSE, FALSE, TRUE, classif.ksvm
##  [1,]                            FALSE
##  [2,]                             TRUE
##  [3,]                             TRUE
##  [4,]                             TRUE
##  [5,]                             TRUE
##  [6,]                             TRUE
##  [7,]                            FALSE
##  [8,]                             TRUE
##  [9,]                             TRUE
## [10,]                             TRUE
## [11,]                             TRUE
## [12,]                             TRUE
## [13,]                            FALSE
## [14,]                             TRUE
## [15,]                             TRUE
##       FALSE, FALSE, TRUE, classif.randomForest
##  [1,]                                     TRUE
##  [2,]                                     TRUE
##  [3,]                                    FALSE
##  [4,]                                     TRUE
##  [5,]                                     TRUE
##  [6,]                                     TRUE
##  [7,]                                     TRUE
##  [8,]                                    FALSE
##  [9,]                                    FALSE
## [10,]                                     TRUE
## [11,]                                     TRUE
## [12,]                                     TRUE
## [13,]                                     TRUE
## [14,]                                     TRUE
## [15,]                                     TRUE
##       FALSE, FALSE, TRUE, classif.xgboost FALSE, TRUE, FALSE, classif.ksvm
##  [1,]                                TRUE                            FALSE
##  [2,]                                TRUE                             TRUE
##  [3,]                               FALSE                             TRUE
##  [4,]                               FALSE                            FALSE
##  [5,]                                TRUE                             TRUE
##  [6,]                                TRUE                             TRUE
##  [7,]                                TRUE                             TRUE
##  [8,]                               FALSE                             TRUE
##  [9,]                               FALSE                            FALSE
## [10,]                               FALSE                            FALSE
## [11,]                                TRUE                             TRUE
## [12,]                                TRUE                             TRUE
## [13,]                                TRUE                            FALSE
## [14,]                                TRUE                             TRUE
## [15,]                                TRUE                             TRUE
##       FALSE, TRUE, FALSE, classif.randomForest
##  [1,]                                     TRUE
##  [2,]                                    FALSE
##  [3,]                                    FALSE
##  [4,]                                     TRUE
##  [5,]                                    FALSE
##  [6,]                                    FALSE
##  [7,]                                     TRUE
##  [8,]                                     TRUE
##  [9,]                                     TRUE
## [10,]                                     TRUE
## [11,]                                    FALSE
## [12,]                                    FALSE
## [13,]                                     TRUE
## [14,]                                    FALSE
## [15,]                                    FALSE
##       FALSE, TRUE, FALSE, classif.xgboost
##  [1,]                                TRUE
##  [2,]                               FALSE
##  [3,]                               FALSE
##  [4,]                                TRUE
##  [5,]                               FALSE
##  [6,]                               FALSE
##  [7,]                                TRUE
##  [8,]                                TRUE
##  [9,]                                TRUE
## [10,]                                TRUE
## [11,]                               FALSE
## [12,]                               FALSE
## [13,]                                TRUE
## [14,]                               FALSE
## [15,]                               FALSE
##       SMOTE, FALSE, FALSE, classif.ksvm
##  [1,]                             FALSE
##  [2,]                              TRUE
##  [3,]                              TRUE
##  [4,]                             FALSE
##  [5,]                              TRUE
##  [6,]                              TRUE
##  [7,]                             FALSE
##  [8,]                              TRUE
##  [9,]                              TRUE
## [10,]                             FALSE
## [11,]                              TRUE
## [12,]                              TRUE
## [13,]                             FALSE
## [14,]                              TRUE
## [15,]                              TRUE
##       SMOTE, FALSE, FALSE, classif.randomForest
##  [1,]                                      TRUE
##  [2,]                                     FALSE
##  [3,]                                     FALSE
##  [4,]                                      TRUE
##  [5,]                                     FALSE
##  [6,]                                     FALSE
##  [7,]                                      TRUE
##  [8,]                                      TRUE
##  [9,]                                      TRUE
## [10,]                                      TRUE
## [11,]                                     FALSE
## [12,]                                     FALSE
## [13,]                                      TRUE
## [14,]                                     FALSE
## [15,]                                     FALSE
##       SMOTE, FALSE, FALSE, classif.xgboost
##  [1,]                                 TRUE
##  [2,]                                FALSE
##  [3,]                                FALSE
##  [4,]                                 TRUE
##  [5,]                                FALSE
##  [6,]                                FALSE
##  [7,]                                 TRUE
##  [8,]                                 TRUE
##  [9,]                                 TRUE
## [10,]                                 TRUE
## [11,]                                FALSE
## [12,]                                FALSE
## [13,]                                 TRUE
## [14,]                                FALSE
## [15,]                                FALSE
```

Plotando grafico de Critical Diference

```r
result = tryCatch({
    plotCD(df, alpha=0.05, cex = 0.35)
}, error = function(e) {})
```


CD
, FALSE, classif.randomForest
ALSE, FALSE, classif.xgboost
TRUE, FALSE, classif.xgboost
, FALSE, classif.randomForest
, FALSE, classif.randomForest
ALSE, FALSE, classif.xgboost
, FALSE, classif.randomForest
ALSE, FALSE, classif.xgboost
FALSE, FALSE, TRUE, classif.
FALSE, FALSE, TRUE, classif.
FALSE, FALSE, FALSE, classif
FALSE, TRUE, FALSE, classif.
ADASYN, FALSE, FALSE, clas
SMOTE, FALSE, FALSE, class
FALSE, FALSE, TRUE, classif.