R Notebook

Parametros:

Measure = Accuracy
Columns = sampling, weight_space, underbagging, learner
Performance = tuning_measure
Filter keys = imba.rate
Filter values = 0.001

```
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)){
  dots = paste0(params$filter_keys," == '",params$filter_values,"'")
  ds = filter_(ds, .dots = dots)
}

summary(ds)
```

```
##                  learner    weight_space
##  classif.ksvm        :600   Mode :logical
##  classif.randomForest:600   FALSE:1440
##  classif.rusboost    :  0   TRUE :360
##  classif.xgboost     :600   NA's :0
##
##
##
##                             measure       sampling    underbagging
##  Accuracy                       :1800   ADASYN: 360   Mode :logical
##  Area under the curve           :   0   FALSE :1080   FALSE:1440
##  F1 measure                     :   0   SMOTE : 360   TRUE :360
##  G-mean                         :   0                 NA's :0
##  Matthews correlation coefficient:   0
##
##
##  tuning_measure   holdout_measure   holdout_measure_residual
##  Min.   :0.1269   Min.   :0.01517   Min.   :0.03881
##  1st Qu.:0.9898   1st Qu.:0.98750   1st Qu.:0.38633
##  Median :0.9938   Median :0.99163   Median :0.76435
##  Mean   :0.9692   Mean   :0.96680   Mean   :0.67114
##  3rd Qu.:0.9990   3rd Qu.:0.99687   3rd Qu.:0.95470
##  Max.   :1.0000   Max.   :1.00000   Max.   :1.00000
##  NA's   :48       NA's   :48        NA's   :48
##  iteration_count                      dataset       imba.rate
##  Min.   :1       abalone                  :  45   Min.   :0.001
##  1st Qu.:1       adult                    :  45   1st Qu.:0.001
##  Median :2       bank                     :  45   Median :0.001
##  Mean   :2       car                      :  45   Mean   :0.001
##  3rd Qu.:3       cardiotocography-10clases:  45   3rd Qu.:0.001
##  Max.   :3       cardiotocography-3clases :  45   Max.   :0.001
##  NA's   :48      (Other)                  :1530
```

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

```r
# 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] 40 15
```

```r
# Renomeando a variavel
df = df_tec_wide_residual

head(df)
```

```
##   ADASYN, FALSE, FALSE, classif.ksvm
## 1                          0.9853969
## 2                          0.9920423
## 3                          0.9987904
## 4                          1.0000000
## 5                          1.0000000
## 6                          0.9986705
##   ADASYN, FALSE, FALSE, classif.randomForest
## 1                                  0.9818597
## 2                                         NA
## 3                                  0.9956889
## 4                                  1.0000000
## 5                                  0.9973705
## 6                                  0.9992247
##   ADASYN, FALSE, FALSE, classif.xgboost FALSE, FALSE, FALSE, classif.ksvm
## 1                             0.9864477                         0.9878042
## 2                             0.9941462                         0.9891070
## 3                             0.9932604                         0.9900002
## 4                             1.0000000                         0.9976581
## 5                             0.9986319                         0.9933338
## 6                             0.9993355                         0.9943033
##   FALSE, FALSE, FALSE, classif.randomForest
## 1                                 0.9897371
## 2                                        NA
## 3                              0.9900002
## 4                              1.0000000
## 5                              0.9931254
## 6                              0.9975915
##   FALSE, FALSE, FALSE, classif.xgboost FALSE, FALSE, TRUE, classif.ksvm
## 1                         0.9897373                          0.5674864
## 2                         0.9915333                          0.8833724
## 3                         0.9901044                          0.4496844
## 4                         0.9997404                          0.9976611
## 5                         0.9945831                          0.9895862
## 6                         0.9967127                          0.9973719
##   FALSE, FALSE, TRUE, classif.randomForest
## 1                             0.5220884
## 2                             0.7848836
## 3                             0.8140604
## 4                             0.9656603
## 5                             0.8943835
## 6                             0.9857571
##   FALSE, FALSE, TRUE, classif.xgboost FALSE, TRUE, FALSE, classif.ksvm
## 1                        0.5574877                          0.9883986
## 2                        0.8011477                          0.9896592
## 3                        0.8115578                          0.9900002
## 4                        0.9282338                          0.9976581
## 5                        0.8864670                          0.9933338
## 6                        0.9627420                          0.9943033
##   FALSE, TRUE, FALSE, classif.randomForest
## 1                             0.9897373
## 2                             0.9913659
## 3                             0.9900002
## 4                             1.0000000
## 5                             0.9931254
## 6                             0.9971510
##   FALSE, TRUE, FALSE, classif.xgboost SMOTE, FALSE, FALSE, classif.ksvm
## 1                        0.9897373                           0.9845604
## 2                        0.9916671                           0.9930487
## 3                        0.9900003                           0.9986848
## 4                        0.9997404                           1.0000000
## 5                        0.9941681                           1.0000000
## 6                        0.9967127                           0.9986707
##   SMOTE, FALSE, FALSE, classif.randomForest
## 1                              0.9821508
## 2                              0.9921162
## 3                              0.9949495
## 4                              1.0000000
## 5                              0.9983165
## 6                              0.9996678
##   SMOTE, FALSE, FALSE, classif.xgboost
## 1                         0.9872722
## 2                         0.9947695
## 3                         0.9942656
## 4                         0.9997364
## 5                         0.9977904
## 6                         0.9994461
```

```r
summary(df)
```

```
##  ADASYN, FALSE, FALSE, classif.ksvm
##  Min.   :0.9337
##  1st Qu.:0.9958
##  Median :0.9988
##  Mean   :0.9955
##  3rd Qu.:0.9997
##  Max.   :1.0000
##  NA's   :2
##  ADASYN, FALSE, FALSE, classif.randomForest
##  Min.   :0.9819
##  1st Qu.:0.9959
##  Median :0.9984
##  Mean   :0.9969
##  3rd Qu.:0.9995
##  Max.   :1.0000
##  NA's   :8
##  ADASYN, FALSE, FALSE, classif.xgboost FALSE, FALSE, FALSE, classif.ksvm
##  Min.   :0.9864                        Min.   :0.9878
##  1st Qu.:0.9940                        1st Qu.:0.9899
##  Median :0.9982                        Median :0.9905
##  Mean   :0.9965                        Mean   :0.9921
##  3rd Qu.:0.9994                        3rd Qu.:0.9937
##  Max.   :1.0000                        Max.   :1.0000
##
##  FALSE, FALSE, FALSE, classif.randomForest
##  Min.   :0.9893
##  1st Qu.:0.9901
##  Median :0.9931
##  Mean   :0.9939
##  3rd Qu.:0.9976
##  Max.   :1.0000
##  NA's   :2
##  FALSE, FALSE, FALSE, classif.xgboost FALSE, FALSE, TRUE, classif.ksvm
##  Min.   :0.9896                       Min.   :0.4327
##  1st Qu.:0.9904                       1st Qu.:0.7905
##  Median :0.9933                       Median :0.9835
##  Mean   :0.9940                       Mean   :0.8819
##  3rd Qu.:0.9970                       3rd Qu.:0.9934
##  Max.   :1.0000                       Max.   :1.0000
##
##  FALSE, FALSE, TRUE, classif.randomForest
##  Min.   :0.5221
##  1st Qu.:0.7952
##  Median :0.9132
##  Mean   :0.8731
##  3rd Qu.:0.9652
##  Max.   :1.0000
##
##  FALSE, FALSE, TRUE, classif.xgboost FALSE, TRUE, FALSE, classif.ksvm
##  Min.   :0.5026                      Min.   :0.9883
##  1st Qu.:0.7948                      1st Qu.:0.9900
##  Median :0.8964                      Median :0.9906
##  Mean   :0.8549                      Mean   :0.9922
##  3rd Qu.:0.9450                      3rd Qu.:0.9937
##  Max.   :1.0000                      Max.   :1.0000
##
##  FALSE, TRUE, FALSE, classif.randomForest
##  Min.   :0.9893
##  1st Qu.:0.9901
##  Median :0.9925
##  Mean   :0.9936
##  3rd Qu.:0.9968
##  Max.   :1.0000
##  NA's   :2
##  FALSE, TRUE, FALSE, classif.xgboost SMOTE, FALSE, FALSE, classif.ksvm
##  Min.   :0.9896                      Min.   :0.9337
##  1st Qu.:0.9905                      1st Qu.:0.9979
##  Median :0.9936                      Median :0.9990
##  Mean   :0.9941                      Mean   :0.9961
##  3rd Qu.:0.9973                      3rd Qu.:1.0000
##  Max.   :1.0000                      Max.   :1.0000
##
##  SMOTE, FALSE, FALSE, classif.randomForest
##  Min.   :0.9822
##  1st Qu.:0.9965
##  Median :0.9992
##  Mean   :0.9972
##  3rd Qu.:0.9999
##  Max.   :1.0000
##  NA's   :2
##  SMOTE, FALSE, FALSE, classif.xgboost
##  Min.   :0.9850
##  1st Qu.:0.9951
##  Median :0.9982
##  Mean   :0.9967
##  3rd Qu.:0.9995
##  Max.   :1.0000
##
```

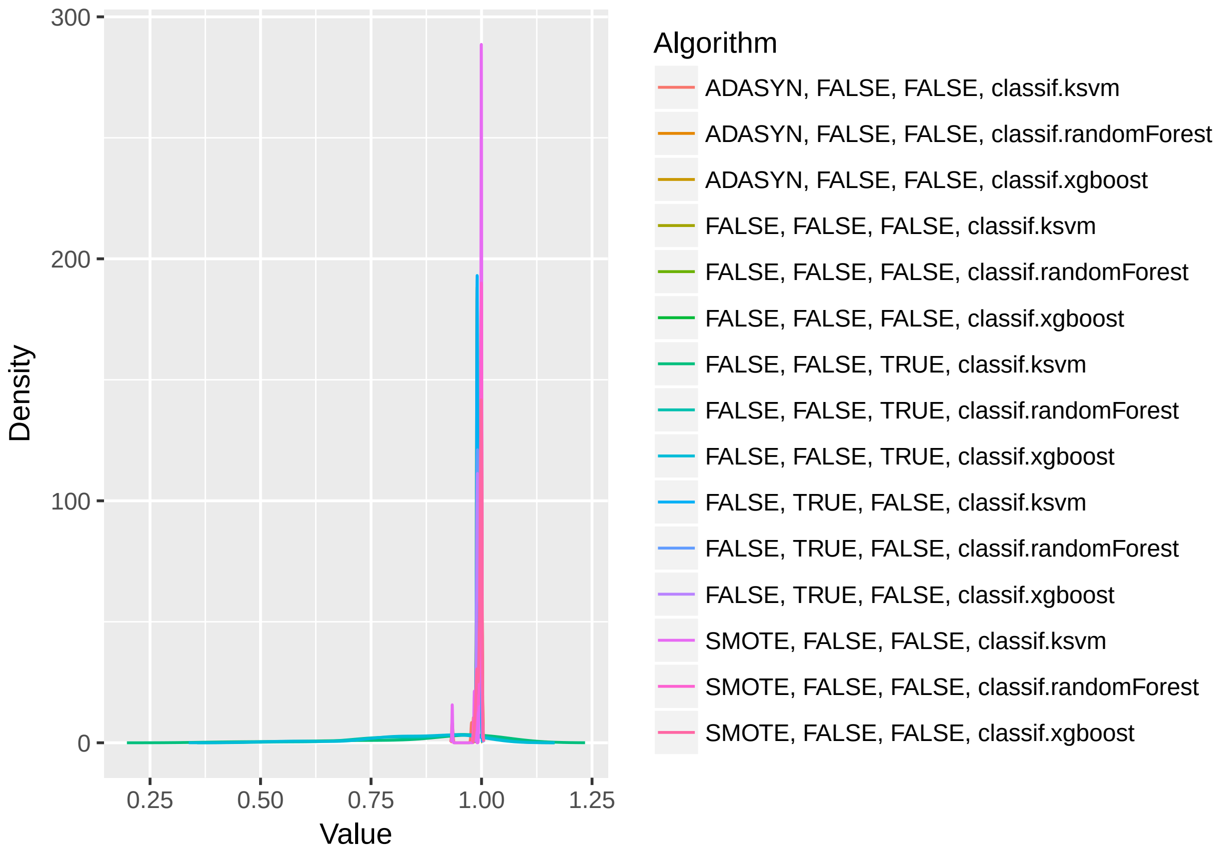
Verificando a média de cada coluna selecionada

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

```
## [1] "Media da coluna ADASYN, FALSE, FALSE, classif.ksvm = 0.995511570830375"
## [1] "Media da coluna ADASYN, FALSE, FALSE, classif.randomForest = 0.996888068447923"
## [1] "Media da coluna ADASYN, FALSE, FALSE, classif.xgboost = 0.996542793985662"
## [1] "Media da coluna FALSE, FALSE, FALSE, classif.ksvm = 0.992104909528212"
## [1] "Media da coluna FALSE, FALSE, FALSE, classif.randomForest = 0.993880690962773"
## [1] "Media da coluna FALSE, FALSE, FALSE, classif.xgboost = 0.994020154009022"
## [1] "Media da coluna FALSE, FALSE, TRUE, classif.ksvm = 0.881932503018145"
## [1] "Media da coluna FALSE, FALSE, TRUE, classif.randomForest = 0.873131594878238"
## [1] "Media da coluna FALSE, FALSE, TRUE, classif.xgboost = 0.854945168435446"
## [1] "Media da coluna FALSE, TRUE, FALSE, classif.ksvm = 0.992194197714511"
## [1] "Media da coluna FALSE, TRUE, FALSE, classif.randomForest = 0.993603182774484"
## [1] "Media da coluna FALSE, TRUE, FALSE, classif.xgboost = 0.994098941840879"
## [1] "Media da coluna SMOTE, FALSE, FALSE, classif.ksvm = 0.996092752637003"
## [1] "Media da coluna SMOTE, FALSE, FALSE, classif.randomForest = 0.997192493438201"
## [1] "Media da coluna SMOTE, FALSE, FALSE, classif.xgboost = 0.996667273471713"
```

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 = 295.55, 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,]                              FALSE
##  [3,]                              FALSE
##  [4,]                               TRUE
##  [5,]                               TRUE
##  [6,]                              FALSE
##  [7,]                               TRUE
##  [8,]                               TRUE
##  [9,]                               TRUE
## [10,]                               TRUE
## [11,]                               TRUE
## [12,]                              FALSE
## [13,]                              FALSE
## [14,]                              FALSE
## [15,]                              FALSE
##       ADASYN, FALSE, FALSE, classif.randomForest
##  [1,]                                      FALSE
##  [2,]                                      FALSE
##  [3,]                                      FALSE
##  [4,]                                       TRUE
##  [5,]                                      FALSE
##  [6,]                                      FALSE
##  [7,]                                       TRUE
##  [8,]                                       TRUE
##  [9,]                                       TRUE
## [10,]                                       TRUE
## [11,]                                      FALSE
## [12,]                                      FALSE
## [13,]                                      FALSE
## [14,]                                      FALSE
## [15,]                                      FALSE
##       ADASYN, FALSE, FALSE, classif.xgboost
##  [1,]                                 FALSE
##  [2,]                                 FALSE
##  [3,]                                 FALSE
##  [4,]                                  TRUE
##  [5,]                                 FALSE
##  [6,]                                 FALSE
##  [7,]                                  TRUE
##  [8,]                                  TRUE
##  [9,]                                  TRUE
## [10,]                                  TRUE
## [11,]                                 FALSE
## [12,]                                 FALSE
## [13,]                                 FALSE
## [14,]                                 FALSE
## [15,]                                 FALSE
##       FALSE, FALSE, FALSE, classif.ksvm
##  [1,]                              TRUE
##  [2,]                              TRUE
##  [3,]                              TRUE
##  [4,]                             FALSE
##  [5,]                             FALSE
##  [6,]                             FALSE
##  [7,]                             FALSE
##  [8,]                             FALSE
##  [9,]                             FALSE
## [10,]                             FALSE
## [11,]                             FALSE
## [12,]                             FALSE
## [13,]                              TRUE
## [14,]                              TRUE
## [15,]                              TRUE
##       FALSE, FALSE, FALSE, classif.randomForest
##  [1,]                                      TRUE
##  [2,]                                     FALSE
##  [3,]                                     FALSE
##  [4,]                                     FALSE
##  [5,]                                     FALSE
##  [6,]                                     FALSE
##  [7,]                                      TRUE
##  [8,]                                      TRUE
##  [9,]                                      TRUE
## [10,]                                     FALSE
## [11,]                                     FALSE
## [12,]                                     FALSE
## [13,]                                      TRUE
## [14,]                                      TRUE
## [15,]                                     FALSE
##       FALSE, FALSE, FALSE, classif.xgboost
##  [1,]                                FALSE
##  [2,]                                FALSE
##  [3,]                                FALSE
##  [4,]                                FALSE
##  [5,]                                FALSE
##  [6,]                                FALSE
##  [7,]                                 TRUE
##  [8,]                                 TRUE
##  [9,]                                 TRUE
## [10,]                                FALSE
## [11,]                                FALSE
## [12,]                                FALSE
## [13,]                                 TRUE
## [14,]                                FALSE
## [15,]                                FALSE
##       FALSE, FALSE, TRUE, classif.ksvm
##  [1,]                             TRUE
##  [2,]                             TRUE
##  [3,]                             TRUE
##  [4,]                            FALSE
##  [5,]                             TRUE
##  [6,]                             TRUE
##  [7,]                            FALSE
##  [8,]                            FALSE
##  [9,]                            FALSE
## [10,]                            FALSE
## [11,]                            FALSE
## [12,]                             TRUE
## [13,]                             TRUE
## [14,]                             TRUE
## [15,]                             TRUE
##       FALSE, FALSE, TRUE, classif.randomForest
##  [1,]                                     TRUE
##  [2,]                                     TRUE
##  [3,]                                     TRUE
##  [4,]                                    FALSE
##  [5,]                                     TRUE
##  [6,]                                     TRUE
##  [7,]                                    FALSE
##  [8,]                                    FALSE
##  [9,]                                    FALSE
## [10,]                                    FALSE
## [11,]                                     TRUE
## [12,]                                     TRUE
## [13,]                                     TRUE
## [14,]                                     TRUE
## [15,]                                     TRUE
##       FALSE, FALSE, TRUE, classif.xgboost FALSE, TRUE, FALSE, classif.ksvm
##  [1,]                                TRUE                             TRUE
##  [2,]                                TRUE                             TRUE
##  [3,]                                TRUE                             TRUE
##  [4,]                               FALSE                            FALSE
##  [5,]                                TRUE                            FALSE
##  [6,]                                TRUE                            FALSE
##  [7,]                               FALSE                            FALSE
##  [8,]                               FALSE                            FALSE
##  [9,]                               FALSE                             TRUE
## [10,]                                TRUE                            FALSE
## [11,]                                TRUE                            FALSE
## [12,]                                TRUE                            FALSE
## [13,]                                TRUE                             TRUE
## [14,]                                TRUE                             TRUE
## [15,]                                TRUE                             TRUE
##       FALSE, TRUE, FALSE, classif.randomForest
##  [1,]                                     TRUE
##  [2,]                                    FALSE
##  [3,]                                    FALSE
##  [4,]                                    FALSE
##  [5,]                                    FALSE
##  [6,]                                    FALSE
##  [7,]                                    FALSE
##  [8,]                                     TRUE
##  [9,]                                     TRUE
## [10,]                                    FALSE
## [11,]                                    FALSE
## [12,]                                    FALSE
## [13,]                                     TRUE
## [14,]                                     TRUE
## [15,]                                     TRUE
##       FALSE, TRUE, FALSE, classif.xgboost
##  [1,]                               FALSE
##  [2,]                               FALSE
##  [3,]                               FALSE
##  [4,]                               FALSE
##  [5,]                               FALSE
##  [6,]                               FALSE
##  [7,]                                TRUE
##  [8,]                                TRUE
##  [9,]                                TRUE
## [10,]                               FALSE
## [11,]                               FALSE
## [12,]                               FALSE
## [13,]                                TRUE
## [14,]                               FALSE
## [15,]                               FALSE
##       SMOTE, FALSE, FALSE, classif.ksvm
##  [1,]                             FALSE
##  [2,]                             FALSE
##  [3,]                             FALSE
##  [4,]                              TRUE
##  [5,]                              TRUE
##  [6,]                              TRUE
##  [7,]                              TRUE
##  [8,]                              TRUE
##  [9,]                              TRUE
## [10,]                              TRUE
## [11,]                              TRUE
## [12,]                              TRUE
## [13,]                             FALSE
## [14,]                             FALSE
## [15,]                             FALSE
##       SMOTE, FALSE, FALSE, classif.randomForest
##  [1,]                                     FALSE
##  [2,]                                     FALSE
##  [3,]                                     FALSE
##  [4,]                                      TRUE
##  [5,]                                      TRUE
##  [6,]                                     FALSE
##  [7,]                                      TRUE
##  [8,]                                      TRUE
##  [9,]                                      TRUE
## [10,]                                      TRUE
## [11,]                                      TRUE
## [12,]                                     FALSE
## [13,]                                     FALSE
## [14,]                                     FALSE
## [15,]                                     FALSE
##       SMOTE, FALSE, FALSE, classif.xgboost
##  [1,]                                FALSE
##  [2,]                               FALSE
##  [3,]                               FALSE
##  [4,]                                TRUE
##  [5,]                               FALSE
##  [6,]                               FALSE
##  [7,]                                TRUE
##  [8,]                                TRUE
##  [9,]                                TRUE
## [10,]                                TRUE
## [11,]                                TRUE
## [12,]                               FALSE
## [13,]                               FALSE
## [14,]                               FALSE
## [15,]                               FALSE
```

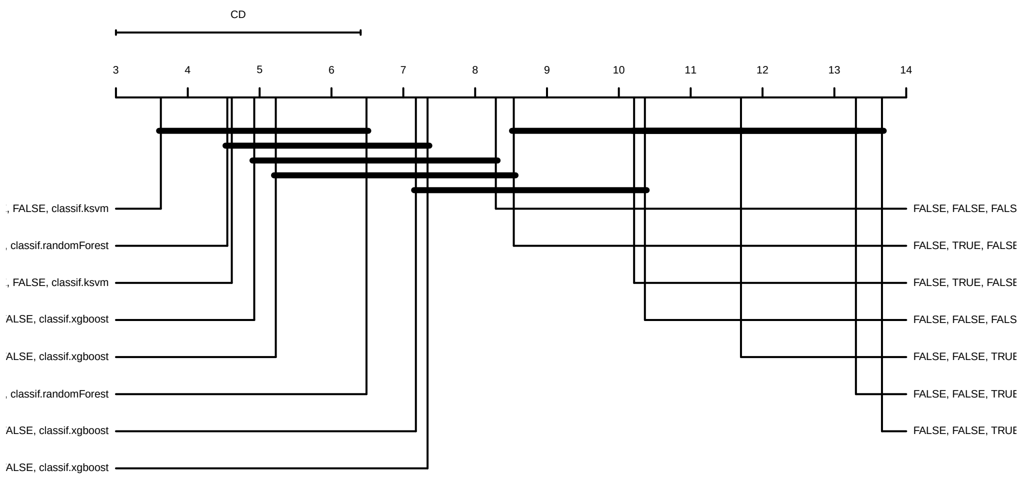
Plotando os ranks

```
print(colMeans(rankMatrix(df)))
```

```
##         ADASYN, FALSE, FALSE, classif.ksvm 
##                                     4.6125 
## ADASYN, FALSE, FALSE, classif.randomForest 
##                                     6.4875 
##      ADASYN, FALSE, FALSE, classif.xgboost 
##                                     5.2250 
##          FALSE, FALSE, FALSE, classif.ksvm 
##                                    10.3625 
##  FALSE, FALSE, FALSE, classif.randomForest 
##                                     8.2875 
##       FALSE, FALSE, FALSE, classif.xgboost 
##                                     7.3375 
##           FALSE, FALSE, TRUE, classif.ksvm 
##                                    11.7000 
##   FALSE, FALSE, TRUE, classif.randomForest 
##                                    13.3000 
##        FALSE, FALSE, TRUE, classif.xgboost 
##                                    13.6625 
##           FALSE, TRUE, FALSE, classif.ksvm 
##                                    10.2125 
##   FALSE, TRUE, FALSE, classif.randomForest 
##                                     8.5375 
##        FALSE, TRUE, FALSE, classif.xgboost 
##                                     7.1750 
##          SMOTE, FALSE, FALSE, classif.ksvm 
##                                     3.6250 
##  SMOTE, FALSE, FALSE, classif.randomForest 
##                                     4.5500 
##       SMOTE, FALSE, FALSE, classif.xgboost 
##                                     4.9250
```

Plotando grafico de Critical Diference

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


CD
, FALSE, classif.ksvm
, classif.randomForest
, FALSE, classif.ksvm
ALSE, classif.xgboost
ALSE, classif.xgboost
, classif.randomForest
ALSE, classif.xgboost
ALSE, classif.xgboost
FALSE, FALSE, FALS
FALSE, TRUE, FALSE
FALSE, TRUE, FALSE
FALSE, FALSE, FALS
FALSE, FALSE, TRUE
FALSE, FALSE, TRUE
FALSE, FALSE, TRUE