R Notebook

Parametros:

Measure = Accuracy
Columns = sampling, weight_space, underbagging, learner
Performance = tuning_measure
Filter keys = imba.rate
Filter values = 0.05

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

Tratamento dos dados

Carregando data set compilado

```r
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        :1230   Mode :logical
##  classif.randomForest:1230   FALSE:2952
##  classif.rusboost    :   0   TRUE :738
##  classif.xgboost     :1230   NA's :0
##
##
##
##                             measure       sampling    underbagging
##  Accuracy                       :3690   ADASYN: 738   Mode :logical
##  Area under the curve           :   0   FALSE :2214   FALSE:2952
##  F1 measure                     :   0   SMOTE : 738   TRUE :738
##  G-mean                         :   0                 NA's :0
##  Matthews correlation coefficient:   0
##
##
##  tuning_measure   holdout_measure   holdout_measure_residual
##  Min.   :0.2470   Min.   :0.04739   Min.   :0.0367
##  1st Qu.:0.9494   1st Qu.:0.94505   1st Qu.:0.3902
##  Median :0.9688   Median :0.96078   Median :0.7223
##  Mean   :0.9425   Mean   :0.93413   Mean   :0.6602
##  3rd Qu.:0.9908   3rd Qu.:0.98413   3rd Qu.:0.9315
##  Max.   :1.0000   Max.   :1.00000   Max.   :1.0000
##  NA's   :42       NA's   :42        NA's   :42
##  iteration_count          dataset       imba.rate
##  Min.   :1       abalone      :  45   Min.   :0.05
##  1st Qu.:1       adult        :  45   1st Qu.:0.05
##  Median :2       annealing    :  45   Median :0.05
##  Mean   :2       arrhythmia   :  45   Mean   :0.05
##  3rd Qu.:3       balance-scale:  45   3rd Qu.:0.05
##  Max.   :3       bank         :  45   Max.   :0.05
##  NA's   :42      (Other)      :3420
```

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$performa

# 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] 82 15
```

```
# Renomeando a variavel
df = df_tec_wide_residual

head(df)
```

```
##   ADASYN, FALSE, FALSE, classif.ksvm
## 1                          0.9453798
## 2                          0.9607452
## 3                          0.9529558
## 4                          0.8433805
## 5                          1.0000000
## 6                          0.9774219
##   ADASYN, FALSE, FALSE, classif.randomForest
## 1                                  0.9386682
## 2                                         NA
## 3                                  0.9932040
## 4                                  0.9932530
## 5                                  1.0000000
## 6                                  0.9765231
##   ADASYN, FALSE, FALSE, classif.xgboost FALSE, FALSE, FALSE, classif.ksvm
## 1                             0.9573086                         0.9266667
## 2                             0.9734333                         0.9447727
## 3                             0.9881291                         0.9494180
## 4                             0.9823549                         0.9474120
## 5                             1.0000000                         1.0000000
## 6                             0.9733316                         0.9500000
##   FALSE, FALSE, FALSE, classif.randomForest
## 1                                 0.9500000
## 2                                 0.9613617
## 3                                 0.9747104
## 4                                 0.9792501
## 5                                 1.0000000
## 6                                 0.9497024
##   FALSE, FALSE, FALSE, classif.xgboost FALSE, FALSE, TRUE, classif.ksvm
## 1                            0.9500000                        0.6054167
## 2                            0.9622584                        0.8949096
## 3                            0.9718904                        0.9331186
## 4                            0.9728548                        0.8485392
## 5                            1.0000000                        0.9902311
## 6                            0.9488095                        0.5355159
##   FALSE, FALSE, TRUE, classif.randomForest
## 1                                0.6205556
## 2                                       NA
## 3                                0.8516012
## 4                                0.9155280
## 5                                0.9939215
## 6                                0.8056548
##   FALSE, FALSE, TRUE, classif.xgboost FALSE, TRUE, FALSE, classif.ksvm
## 1                           0.6205556                        0.9345833
## 2                           0.8093866                        0.9481514
## 3                           0.8521510                        0.9522324
## 4                           0.9282494                        0.9474120
## 5                           0.9426498                        1.0000000
## 6                           0.7994048                        0.9500000
##   FALSE, TRUE, FALSE, classif.randomForest
## 1                                0.9500000
## 2                                0.9614898
## 3                                0.9763968
## 4                                0.9744651
## 5                                1.0000000
## 6                                0.9497024
##   FALSE, TRUE, FALSE, classif.xgboost SMOTE, FALSE, FALSE, classif.ksvm
## 1                           0.9500000                         0.9448830
## 2                           0.9628509                         0.9602482
## 3                           0.9701983                         0.9613247
## 4                           0.9744882                         0.8173401
## 5                           1.0000000                         1.0000000
## 6                           0.9498016                         0.9852235
##   SMOTE, FALSE, FALSE, classif.randomForest
## 1                                 0.9364035
## 2                                 0.9678472
## 3                                 0.9879112
## 4                                 0.9932660
## 5                                 1.0000000
## 6                                 0.9764515
##   SMOTE, FALSE, FALSE, classif.xgboost
## 1                            0.9538012
## 2                            0.9747191
## 3                            0.9873090
## 4                            0.9772727
## 5                            1.0000000
## 6                            0.9720134
```

```r
summary(df)
```

```
##  ADASYN, FALSE, FALSE, classif.ksvm
##  Min.   :0.7408
##  1st Qu.:0.9578
##  Median :0.9792
##  Mean   :0.9640
##  3rd Qu.:0.9949
##  Max.   :1.0000
##  NA's   :1
##  ADASYN, FALSE, FALSE, classif.randomForest
##  Min.   :0.7035
##  1st Qu.:0.9717
##  Median :0.9915
##  Mean   :0.9755
##  3rd Qu.:0.9983
##  Max.   :1.0000
##  NA's   :4
##  ADASYN, FALSE, FALSE, classif.xgboost FALSE, FALSE, FALSE, classif.ksvm
##  Min.   :0.7120                        Min.   :0.9264
##  1st Qu.:0.9674                        1st Qu.:0.9496
##  Median :0.9875                        Median :0.9521
##  Mean   :0.9733                        Mean   :0.9585
##  3rd Qu.:0.9962                        3rd Qu.:0.9649
##  Max.   :1.0000                        Max.   :1.0000
##
##  FALSE, FALSE, FALSE, classif.randomForest
##  Min.   :0.9442
##  1st Qu.:0.9543
##  Median :0.9700
##  Mean   :0.9708
##  3rd Qu.:0.9846
##  Max.   :1.0000
##  NA's   :1
##  FALSE, FALSE, FALSE, classif.xgboost FALSE, FALSE, TRUE, classif.ksvm
##  Min.   :0.9440                       Min.   :0.4146
##  1st Qu.:0.9543                       1st Qu.:0.7063
##  Median :0.9708                       Median :0.9151
##  Mean   :0.9712                       Mean   :0.8332
##  3rd Qu.:0.9856                       3rd Qu.:0.9682
##  Max.   :1.0000                       Max.   :0.9982
##
##  FALSE, FALSE, TRUE, classif.randomForest
##  Min.   :0.4222
##  1st Qu.:0.7694
##  Median :0.8938
##  Mean   :0.8424
##  3rd Qu.:0.9601
##  Max.   :1.0000
##  NA's   :3
##  FALSE, FALSE, TRUE, classif.xgboost FALSE, TRUE, FALSE, classif.ksvm
##  Min.   :0.3600                      Min.   :0.9346
##  1st Qu.:0.7693                      1st Qu.:0.9497
##  Median :0.8715                      Median :0.9521
##  Mean   :0.8369                      Mean   :0.9587
##  3rd Qu.:0.9487                      3rd Qu.:0.9639
##  Max.   :1.0000                      Max.   :1.0000
##
##  FALSE, TRUE, FALSE, classif.randomForest
##  Min.   :0.9442
##  1st Qu.:0.9529
##  Median :0.9689
##  Mean   :0.9708
##  3rd Qu.:0.9870
##  Max.   :1.0000
##  NA's   :1
##  FALSE, TRUE, FALSE, classif.xgboost SMOTE, FALSE, FALSE, classif.ksvm
##  Min.   :0.9440                      Min.   :0.7394
##  1st Qu.:0.9543                      1st Qu.:0.9577
##  Median :0.9708                      Median :0.9792
##  Mean   :0.9712                      Mean   :0.9622
##  3rd Qu.:0.9851                      3rd Qu.:0.9931
##  Max.   :1.0000                      Max.   :1.0000
##
##  SMOTE, FALSE, FALSE, classif.randomForest
##  Min.   :0.7259
##  1st Qu.:0.9718
##  Median :0.9911
##  Mean   :0.9754
##  3rd Qu.:0.9978
##  Max.   :1.0000
##  NA's   :4
##  SMOTE, FALSE, FALSE, classif.xgboost
##  Min.   :0.6952
##  1st Qu.:0.9679
##  Median :0.9874
##  Mean   :0.9732
##  3rd Qu.:0.9964
##  Max.   :1.0000
##
```

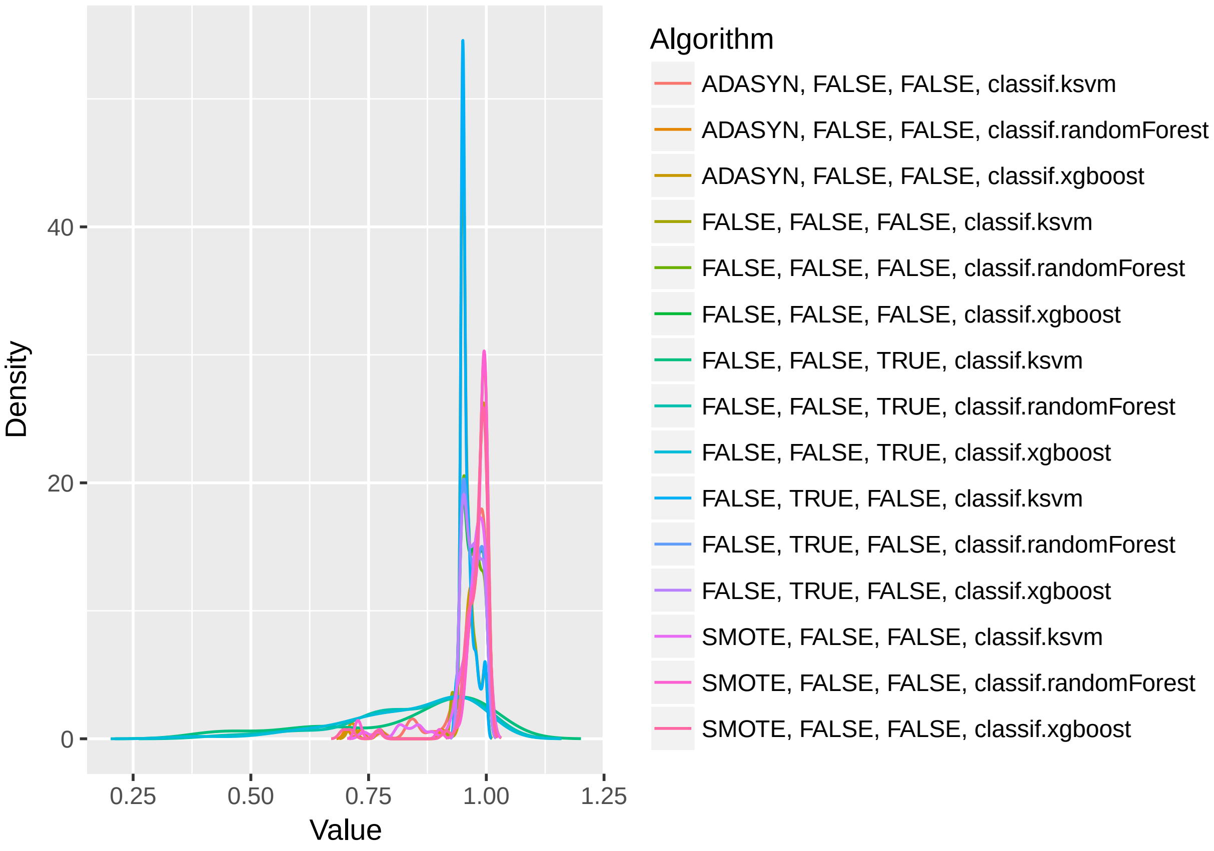
Verificando a média de cada coluna selecionada

```
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 = 0.964025236569767"
## [1] "Media da coluna ADASYN, FALSE, FALSE, classif.randomForest = 0.975473207484394"
## [1] "Media da coluna ADASYN, FALSE, FALSE, classif.xgboost = 0.973346351429288"
## [1] "Media da coluna FALSE, FALSE, FALSE, classif.ksvm = 0.958493157114079"
## [1] "Media da coluna FALSE, FALSE, FALSE, classif.randomForest = 0.970841181840409"
## [1] "Media da coluna FALSE, FALSE, FALSE, classif.xgboost = 0.971249595483984"
## [1] "Media da coluna FALSE, FALSE, TRUE, classif.ksvm = 0.833173562108117"
## [1] "Media da coluna FALSE, FALSE, TRUE, classif.randomForest = 0.842420653375876"
## [1] "Media da coluna FALSE, FALSE, TRUE, classif.xgboost = 0.836888855277703"
## [1] "Media da coluna FALSE, TRUE, FALSE, classif.ksvm = 0.958658104029159"
## [1] "Media da coluna FALSE, TRUE, FALSE, classif.randomForest = 0.97083851619639"
## [1] "Media da coluna FALSE, TRUE, FALSE, classif.xgboost = 0.971153937701804"
## [1] "Media da coluna SMOTE, FALSE, FALSE, classif.ksvm = 0.962176401536434"
## [1] "Media da coluna SMOTE, FALSE, FALSE, classif.randomForest = 0.975446308141522"
## [1] "Media da coluna SMOTE, FALSE, FALSE, classif.xgboost = 0.973221273184089"
```

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 = 636.99, 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,]                              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.randomForest
##  [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
##       ADASYN, FALSE, FALSE, classif.xgboost
##  [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
##       FALSE, FALSE, FALSE, classif.ksvm
##  [1,]                              TRUE
##  [2,]                              TRUE
##  [3,]                              TRUE
##  [4,]                             FALSE
##  [5,]                              TRUE
##  [6,]                              TRUE
##  [7,]                             FALSE
##  [8,]                              TRUE
##  [9,]                              TRUE
## [10,]                             FALSE
## [11,]                              TRUE
## [12,]                              TRUE
## [13,]                              TRUE
## [14,]                              TRUE
## [15,]                              TRUE
##       FALSE, FALSE, FALSE, classif.randomForest
##  [1,]                                     FALSE
##  [2,]                                      TRUE
##  [3,]                                      TRUE
##  [4,]                                      TRUE
##  [5,]                                     FALSE
##  [6,]                                     FALSE
##  [7,]                                      TRUE
##  [8,]                                      TRUE
##  [9,]                                      TRUE
## [10,]                                      TRUE
## [11,]                                     FALSE
## [12,]                                     FALSE
## [13,]                                     FALSE
## [14,]                                      TRUE
## [15,]                                      TRUE
##       FALSE, FALSE, FALSE, classif.xgboost
##  [1,]                                FALSE
##  [2,]                                 TRUE
##  [3,]                                 TRUE
##  [4,]                                 TRUE
##  [5,]                                FALSE
##  [6,]                                FALSE
##  [7,]                                 TRUE
##  [8,]                                 TRUE
##  [9,]                                 TRUE
## [10,]                                 TRUE
## [11,]                                FALSE
## [12,]                                FALSE
## [13,]                                FALSE
## [14,]                                 TRUE
## [15,]                                 TRUE
##       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,]                             TRUE
## [12,]                             TRUE
## [13,]                             TRUE
## [14,]                             TRUE
## [15,]                             TRUE
##       FALSE, FALSE, TRUE, classif.randomForest
##  [1,]                                     TRUE
##  [2,]                                     TRUE
##  [3,]                                     TRUE
##  [4,]                                     TRUE
##  [5,]                                     TRUE
##  [6,]                                     TRUE
##  [7,]                                    FALSE
##  [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                             TRUE
##  [2,]                                TRUE                             TRUE
##  [3,]                                TRUE                             TRUE
##  [4,]                                TRUE                            FALSE
##  [5,]                                TRUE                             TRUE
##  [6,]                                TRUE                             TRUE
##  [7,]                               FALSE                            FALSE
##  [8,]                               FALSE                             TRUE
##  [9,]                               FALSE                             TRUE
## [10,]                                TRUE                            FALSE
## [11,]                                TRUE                             TRUE
## [12,]                                TRUE                             TRUE
## [13,]                                TRUE                             TRUE
## [14,]                                TRUE                             TRUE
## [15,]                                TRUE                             TRUE
##       FALSE, TRUE, FALSE, classif.randomForest
##  [1,]                                    FALSE
##  [2,]                                     TRUE
##  [3,]                                     TRUE
##  [4,]                                     TRUE
##  [5,]                                    FALSE
##  [6,]                                    FALSE
##  [7,]                                     TRUE
##  [8,]                                     TRUE
##  [9,]                                     TRUE
## [10,]                                     TRUE
## [11,]                                    FALSE
## [12,]                                    FALSE
## [13,]                                    FALSE
## [14,]                                     TRUE
## [15,]                                     TRUE
##       FALSE, TRUE, FALSE, classif.xgboost
##  [1,]                               FALSE
##  [2,]                                TRUE
##  [3,]                                TRUE
##  [4,]                                TRUE
##  [5,]                               FALSE
##  [6,]                               FALSE
##  [7,]                                TRUE
##  [8,]                                TRUE
##  [9,]                                TRUE
## [10,]                                TRUE
## [11,]                               FALSE
## [12,]                               FALSE
## [13,]                               FALSE
## [14,]                                TRUE
## [15,]                                TRUE
##       SMOTE, FALSE, FALSE, classif.ksvm
##  [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
##       SMOTE, FALSE, FALSE, classif.randomForest
##  [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.xgboost
##  [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
```

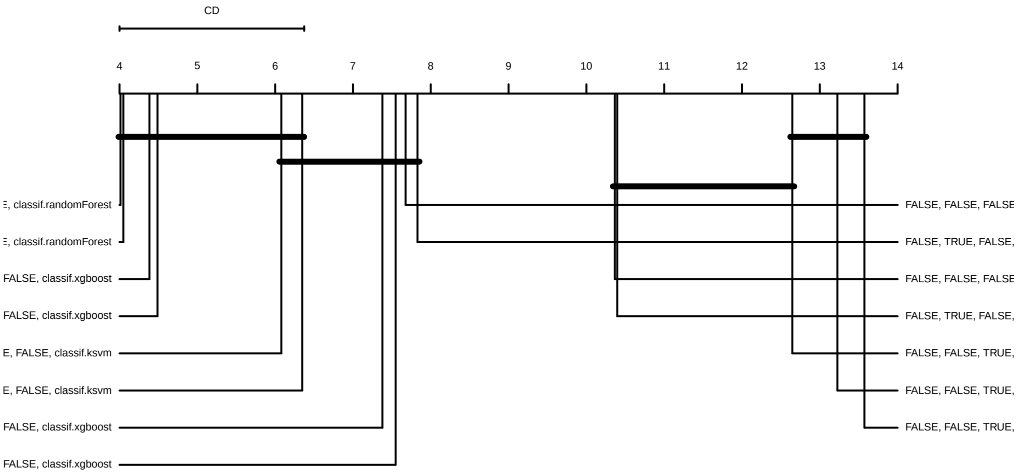
Plotando os ranks

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

```
##         ADASYN, FALSE, FALSE, classif.ksvm
##                                   6.347561
## ADASYN, FALSE, FALSE, classif.randomForest
##                                   4.048780
##      ADASYN, FALSE, FALSE, classif.xgboost
##                                   4.384146
##          FALSE, FALSE, FALSE, classif.ksvm
##                                  10.365854
##  FALSE, FALSE, FALSE, classif.randomForest
##                                   7.676829
##       FALSE, FALSE, FALSE, classif.xgboost
##                                   7.378049
##           FALSE, FALSE, TRUE, classif.ksvm
##                                  12.646341
##   FALSE, FALSE, TRUE, classif.randomForest
##                                  13.225610
##        FALSE, FALSE, TRUE, classif.xgboost
##                                  13.573171
##           FALSE, TRUE, FALSE, classif.ksvm
##                                  10.396341
##   FALSE, TRUE, FALSE, classif.randomForest
##                                   7.829268
##        FALSE, TRUE, FALSE, classif.xgboost
##                                   7.548780
##          SMOTE, FALSE, FALSE, classif.ksvm
##                                   6.079268
##  SMOTE, FALSE, FALSE, classif.randomForest
##                                   4.012195
##       SMOTE, FALSE, FALSE, classif.xgboost
##                                   4.487805
```

Plotando grafico de Critical Diference

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


CD
E, classif.randomForest
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