R Notebook

Parametros:

Measure = Area under the curve
Columns = sampling, weight_space, underbagging, learner
Performance = holdout_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                        :   0   ADASYN: 738   Mode :logical
##  Area under the curve            :3690   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.   :0.3977   Min.   :0.0000   Min.   :0.0000
##  1st Qu.:0.9145   1st Qu.:0.8175   1st Qu.:0.6976
##  Median :0.9932   Median :0.9755   Median :0.8806
##  Mean   :0.9282   Mean   :0.8846   Mean   :0.8211
##  3rd Qu.:0.9997   3rd Qu.:0.9992   3rd Qu.:0.9784
##  Max.   :1.0000   Max.   :1.0000   Max.   :1.0000
##  NA's   :84       NA's   :84       NA's   :84
##  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   :84      (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

```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] 82 15
```

```r
# Renomeando a variavel
df = df_tec_wide_residual

head(df)
```

```
##   ADASYN, FALSE, FALSE, classif.ksvm
## 1                          0.6462768
## 2                                 NA
## 3                          0.8346939
## 4                          0.5918367
## 5                          1.0000000
## 6                          0.8085591
##   ADASYN, FALSE, FALSE, classif.randomForest
## 1                                  0.7047856
## 2                                  0.8843849
## 3                                  0.9775510
## 4                                  0.9591837
## 5                                  1.0000000
## 6                                  0.8820066
##   ADASYN, FALSE, FALSE, classif.xgboost FALSE, FALSE, FALSE, classif.ksvm
## 1                             0.6442008                         0.6674464
## 2                             0.9069466                                NA
## 3                             0.9887755                         0.8908163
## 4                             0.9115646                         0.5000000
## 5                             1.0000000                         1.0000000
## 6                             0.8979194                         0.7755400
##   FALSE, FALSE, FALSE, classif.randomForest
## 1                                 0.6383431
## 2                                 0.9069248
## 3                                 0.9937075
## 4                                 0.9370748
## 5                                 1.0000000
## 6                                 0.9163037
##   FALSE, FALSE, FALSE, classif.xgboost FALSE, FALSE, TRUE, classif.ksvm
## 1                            0.6924366                        0.6777485
## 2                            0.9203982                        0.8300474
## 3                            0.9836735                        0.8841837
## 4                            0.9693878                        0.6751701
## 5                            1.0000000                        1.0000000
## 6                            0.8608078                        0.8093895
##   FALSE, FALSE, TRUE, classif.randomForest
## 1                                0.6600585
## 2                                       NA
## 3                                0.9904762
## 4                                0.9421769
## 5                                1.0000000
## 6                                0.8819270
##   FALSE, FALSE, TRUE, classif.xgboost FALSE, TRUE, FALSE, classif.ksvm
## 1                           0.7141033                               NA
## 2                           0.9136941                               NA
## 3                           0.9566327                        0.8908163
## 4                           0.9710884                        0.5000000
## 5                           1.0000000                        1.0000000
## 6                           0.8674663                        0.7755400
##   FALSE, TRUE, FALSE, classif.randomForest
## 1                                0.6383431
## 2                                0.9009547
## 3                                0.9911565
## 4                                0.9863946
## 5                                1.0000000
## 6                                0.9163037
##   FALSE, TRUE, FALSE, classif.xgboost SMOTE, FALSE, FALSE, classif.ksvm
## 1                           0.6997758                         0.6413060
## 2                           0.9219113                                NA
## 3                           0.9870748                         0.7391156
## 4                           0.9761905                         0.5442177
## 5                           1.0000000                         1.0000000
## 6                           0.8578192                         0.8102200
##   SMOTE, FALSE, FALSE, classif.randomForest
## 1                                 0.6820760
## 2                                        NA
## 3                                 0.9942177
## 4                                 0.9285714
## 5                                 1.0000000
## 6                                 0.8969845
##   SMOTE, FALSE, FALSE, classif.xgboost
## 1                            0.6484016
## 2                            0.9075624
## 3                            0.9850340
## 4                            0.9421769
## 5                            1.0000000
## 6                            0.8983471
```

```r
summary(df)
```

```
##  ADASYN, FALSE, FALSE, classif.ksvm
##  Min.   :0.4185
##  1st Qu.:0.7007
##  Median :0.8743
##  Mean   :0.8388
##  3rd Qu.:0.9870
##  Max.   :1.0000
##  NA's   :5
##  ADASYN, FALSE, FALSE, classif.randomForest
##  Min.   :0.3435
##  1st Qu.:0.8832
##  Median :0.9797
##  Mean   :0.9171
##  3rd Qu.:0.9987
##  Max.   :1.0000
##  NA's   :3
##  ADASYN, FALSE, FALSE, classif.xgboost FALSE, FALSE, FALSE, classif.ksvm
##  Min.   :0.4176                        Min.   :0.3991
##  1st Qu.:0.8796                        1st Qu.:0.6745
##  Median :0.9686                        Median :0.8976
##  Mean   :0.8983                        Mean   :0.8260
##  3rd Qu.:0.9969                        3rd Qu.:0.9925
##  Max.   :1.0000                        Max.   :1.0000
##                                        NA's   :4
##  FALSE, FALSE, FALSE, classif.randomForest
##  Min.   :0.4308
##  1st Qu.:0.8920
##  Median :0.9807
##  Mean   :0.9082
##  3rd Qu.:0.9994
##  Max.   :1.0000
##  NA's   :2
##  FALSE, FALSE, FALSE, classif.xgboost FALSE, FALSE, TRUE, classif.ksvm
##  Min.   :0.4917                       Min.   :0.4769
##  1st Qu.:0.8712                       1st Qu.:0.7038
##  Median :0.9758                       Median :0.8730
##  Mean   :0.9169                       Mean   :0.8354
##  3rd Qu.:0.9942                       3rd Qu.:0.9638
##  Max.   :1.0000                       Max.   :1.0000
##
##  FALSE, FALSE, TRUE, classif.randomForest
##  Min.   :0.5018
##  1st Qu.:0.8525
##  Median :0.9751
##  Mean   :0.9054
##  3rd Qu.:0.9935
##  Max.   :1.0000
##  NA's   :3
##  FALSE, FALSE, TRUE, classif.xgboost FALSE, TRUE, FALSE, classif.ksvm
##  Min.   :0.4469                      Min.   :0.3991
##  1st Qu.:0.8532                      1st Qu.:0.6745
##  Median :0.9700                      Median :0.8953
##  Mean   :0.9045                    Mean   :0.8272
##  3rd Qu.:0.9935                    3rd Qu.:0.9925
##  Max.   :1.0000                    Max.   :1.0000
##                                    NA's   :4
##  FALSE, TRUE, FALSE, classif.randomForest
##  Min.   :0.4088
##  1st Qu.:0.8960
##  Median :0.9838
##  Mean   :0.9162
##  3rd Qu.:0.9990
##  Max.   :1.0000
##
##  FALSE, TRUE, FALSE, classif.xgboost SMOTE, FALSE, FALSE, classif.ksvm
##  Min.   :0.4611                    Min.   :0.3773
##  1st Qu.:0.8571                    1st Qu.:0.7174
##  Median :0.9777                    Median :0.8374
##  Mean   :0.9121                    Mean   :0.8315
##  3rd Qu.:0.9963                    3rd Qu.:0.9847
##  Max.   :1.0000                    Max.   :1.0000
##                                    NA's   :3
##  SMOTE, FALSE, FALSE, classif.randomForest
##  Min.   :0.4685
##  1st Qu.:0.8920
##  Median :0.9834
##  Mean   :0.9151
##  3rd Qu.:0.9985
##  Max.   :1.0000
##  NA's   :4
##  SMOTE, FALSE, FALSE, classif.xgboost
##  Min.   :0.5200
##  1st Qu.:0.8806
##  Median :0.9823
##  Mean   :0.9093
##  3rd Qu.:0.9975
##  Max.   :1.0000
##
```

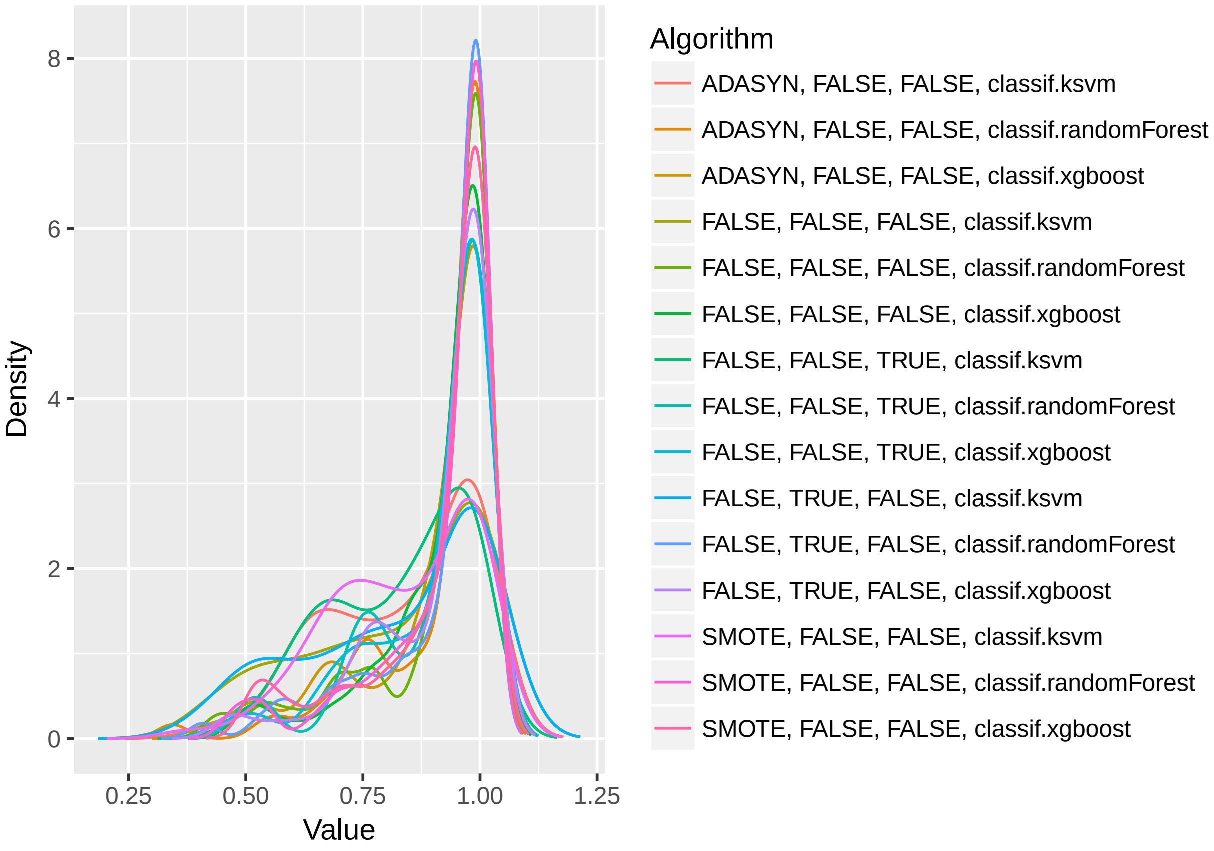
Verificando a média de cada coluna selecionada

```
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 = 0.838811280037709"
## [1] "Media da coluna ADASYN, FALSE, FALSE, classif.randomForest = 0.917130209074314"
## [1] "Media da coluna ADASYN, FALSE, FALSE, classif.xgboost = 0.898292797673017"
## [1] "Media da coluna FALSE, FALSE, FALSE, classif.ksvm = 0.826037266142787"
## [1] "Media da coluna FALSE, FALSE, FALSE, classif.randomForest = 0.908181598903527"
## [1] "Media da coluna FALSE, FALSE, FALSE, classif.xgboost = 0.916943350639857"
## [1] "Media da coluna FALSE, FALSE, TRUE, classif.ksvm = 0.835393191528209"
## [1] "Media da coluna FALSE, FALSE, TRUE, classif.randomForest = 0.90537313758152"
## [1] "Media da coluna FALSE, FALSE, TRUE, classif.xgboost = 0.904526425056321"
## [1] "Media da coluna FALSE, TRUE, FALSE, classif.ksvm = 0.827241108019741"
## [1] "Media da coluna FALSE, TRUE, FALSE, classif.randomForest = 0.91617178552635"
## [1] "Media da coluna FALSE, TRUE, FALSE, classif.xgboost = 0.912119331397177"
## [1] "Media da coluna SMOTE, FALSE, FALSE, classif.ksvm = 0.831536550259147"
## [1] "Media da coluna SMOTE, FALSE, FALSE, classif.randomForest = 0.915132907203918"
## [1] "Media da coluna SMOTE, FALSE, FALSE, classif.xgboost = 0.909290678721929"
```

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 = 243.44, df = 14, p-value < 2.2e-16
```

Testando as diferencas par a par

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

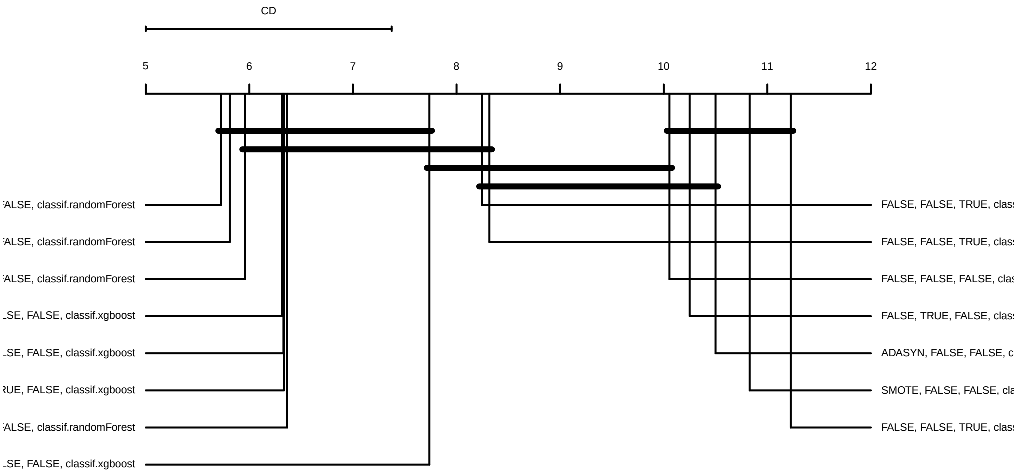
Plotando os ranks

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

```
##         ADASYN, FALSE, FALSE, classif.ksvm
##                                  10.500000
## ADASYN, FALSE, FALSE, classif.randomForest
##                                   5.810976
##      ADASYN, FALSE, FALSE, classif.xgboost
##                                   7.737805
##          FALSE, FALSE, FALSE, classif.ksvm
##                                  10.054878
##  FALSE, FALSE, FALSE, classif.randomForest
##                                   6.365854
##       FALSE, FALSE, FALSE, classif.xgboost
##                                   6.329268
##           FALSE, FALSE, TRUE, classif.ksvm
##                                  11.225610
##   FALSE, FALSE, TRUE, classif.randomForest
##                                   8.317073
##        FALSE, FALSE, TRUE, classif.xgboost
##                                   8.243902
##           FALSE, TRUE, FALSE, classif.ksvm
##                                  10.250000
##   FALSE, TRUE, FALSE, classif.randomForest
##                                   5.725610
##        FALSE, TRUE, FALSE, classif.xgboost
##                                   6.335366
##          SMOTE, FALSE, FALSE, classif.ksvm
##                                  10.829268
##  SMOTE, FALSE, FALSE, classif.randomForest
##                                   5.957317
##       SMOTE, FALSE, FALSE, classif.xgboost
##                                   6.317073
```

Plotando grafico de Critical Diference

```
result = tryCatch({
    plotCD(df, alpha=0.05, cex = 0.35)
}, error = function(e) {})
```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ALSE, classif.randomForest
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ADASYN, FALSE, FALSE, c
SMOTE, FALSE, FALSE, cla
FALSE, FALSE, TRUE, clas