R Notebook

Parametros:

Measure = Matthews correlation coefficient
Columns = sampling, weight_space, underbagging, learner
Performance = holdout_measure_residual
Filter keys = imba.rate
Filter values = 0.01

```
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                        :   0   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:1800
##
##
##  tuning_measure     holdout_measure   holdout_measure_residual
##  Min.   :-0.00646   Min.   :-0.1370   Min.   :-0.06817
##  1st Qu.: 0.23261   1st Qu.: 0.0000   1st Qu.: 0.02011
##  Median : 0.82014   Median : 0.3764   Median : 0.19200
##  Mean   : 0.64070   Mean   : 0.4285   Mean   : 0.29498
##  3rd Qu.: 0.99730   3rd Qu.: 0.8152   3rd Qu.: 0.49996
##  Max.   : 1.00000   Max.   : 1.0000   Max.   : 1.00000
##  NA's   :69         NA's   :69        NA's   :69
##  iteration_count                      dataset       imba.rate
##  Min.   :1       abalone                  :  45   Min.   :0.01
##  1st Qu.:1       adult                    :  45   1st Qu.:0.01
##  Median :2       bank                     :  45   Median :0.01
##  Mean   :2       car                      :  45   Mean   :0.01
##  3rd Qu.:3       cardiotocography-10clases:  45   3rd Qu.:0.01
##  Max.   :3       cardiotocography-3clases :  45   Max.   :0.01
##  NA's   :69      (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

```
# 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] 40 15
```

```
# Renomeando a variavel
df = df_tec_wide_residual

summary(df)
```

```
##  ADASYN, FALSE, FALSE, classif.ksvm
##  Min.   :-0.002393
##  1st Qu.: 0.000000
##  Median : 0.058874
##  Mean   : 0.138420
##  3rd Qu.: 0.196052
##  Max.   : 0.851072
##  NA's   :2
##  ADASYN, FALSE, FALSE, classif.randomForest
##  Min.   :-0.005847
##  1st Qu.: 0.056921
##  Median : 0.247470
##  Mean   : 0.320701
##  3rd Qu.: 0.518985
##  Max.   : 0.950347
##  NA's   :8
##  ADASYN, FALSE, FALSE, classif.xgboost FALSE, FALSE, FALSE, classif.ksvm
##  Min.   :-0.03745                      Min.   :-0.0008605
##  1st Qu.: 0.09532                      1st Qu.: 0.0000000
##  Median : 0.39846                      Median : 0.0786579
##  Mean   : 0.38898                      Mean   : 0.1900848
##  3rd Qu.: 0.52592                      3rd Qu.: 0.2433956
##  Max.   : 0.95928                      Max.   : 0.8585106
##
```

```
##  FALSE, FALSE, FALSE, classif.randomForest
##  Min.   :-0.01023
##  1st Qu.: 0.01367
##  Median : 0.17754
##  Mean   : 0.26425
##  3rd Qu.: 0.49381
##  Max.   : 0.89881
##  NA's   :3
##  FALSE, FALSE, FALSE, classif.xgboost FALSE, FALSE, TRUE, classif.ksvm
##  Min.   :-0.03888                     Min.   :-0.003467
##  1st Qu.: 0.05539                     1st Qu.: 0.095746
##  Median : 0.25404                     Median : 0.324663
##  Mean   : 0.30227                     Mean   : 0.316728
##  3rd Qu.: 0.48833                     3rd Qu.: 0.525981
##  Max.   : 0.90474                     Max.   : 0.914968
##
##  FALSE, FALSE, TRUE, classif.randomForest
##  Min.   :0.006653
##  1st Qu.:0.147313
##  Median :0.471366
##  Mean   :0.456152
##  3rd Qu.:0.735894
##  Max.   :0.916350
##  NA's   :1
##  FALSE, FALSE, TRUE, classif.xgboost FALSE, TRUE, FALSE, classif.ksvm
##  Min.   :0.01815                     Min.   :-0.0008605
##  1st Qu.:0.18818                     1st Qu.: 0.0000000
##  Median :0.46926                     Median : 0.0758148
##  Mean   :0.45167                     Mean   : 0.1866649
##  3rd Qu.:0.67906                     3rd Qu.: 0.2433956
##  Max.   :0.89511                     Max.   : 0.8585106
##
##  FALSE, TRUE, FALSE, classif.randomForest
##  Min.   :-0.02457
##  1st Qu.: 0.02226
##  Median : 0.15128
##  Mean   : 0.26963
##  3rd Qu.: 0.49383
##  Max.   : 0.88606
##  NA's   :4
##  FALSE, TRUE, FALSE, classif.xgboost SMOTE, FALSE, FALSE, classif.ksvm
##  Min.   :-0.04521                    Min.   :-0.002561
##  1st Qu.: 0.05402                    1st Qu.: 0.001628
##  Median : 0.24338                    Median : 0.063074
##  Mean   : 0.30232                    Mean   : 0.142549
##  3rd Qu.: 0.49302                    3rd Qu.: 0.178964
##  Max.   : 0.89582                    Max.   : 0.709685
##
##  SMOTE, FALSE, FALSE, classif.randomForest
##  Min.   :-0.004377
##  1st Qu.: 0.070937
##  Median : 0.228796
##  Mean   : 0.299965
##  3rd Qu.: 0.460087
```

```
##  Max.   : 0.938403
##  NA's   :5
##  SMOTE, FALSE, FALSE, classif.xgboost
##  Min.   :-0.06687
##  1st Qu.: 0.10196
##  Median : 0.38049
##  Mean   : 0.39147
##  3rd Qu.: 0.59879
##  Max.   : 0.93815
##
```

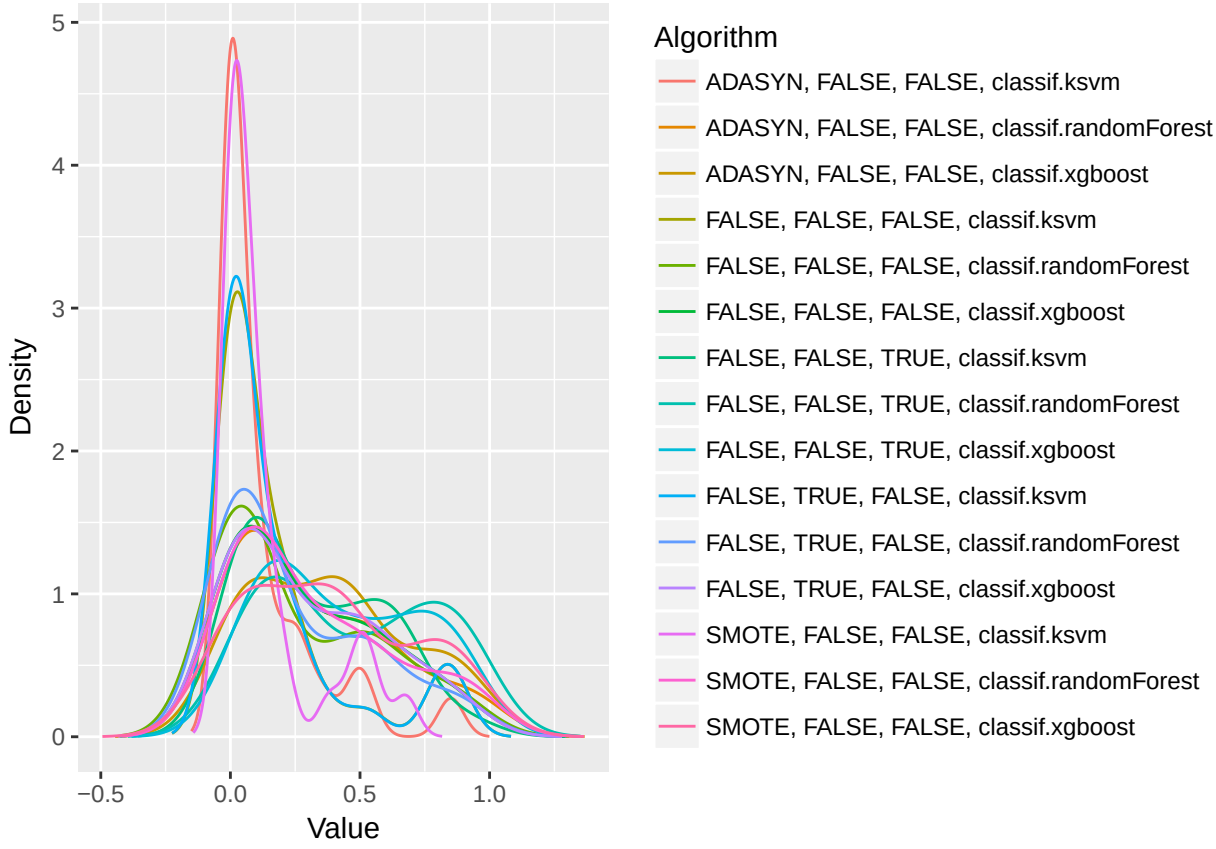
Verificando a média de cada coluna selecionada

```
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 = 0.13841968187075"
## [1] "Media da coluna ADASYN, FALSE, FALSE, classif.randomForest = 0.320701152073292"
## [1] "Media da coluna ADASYN, FALSE, FALSE, classif.xgboost = 0.388975025643202"
## [1] "Media da coluna FALSE, FALSE, FALSE, classif.ksvm = 0.190084830988913"
## [1] "Media da coluna FALSE, FALSE, FALSE, classif.randomForest = 0.264245987227245"
## [1] "Media da coluna FALSE, FALSE, FALSE, classif.xgboost = 0.302270429895642"
## [1] "Media da coluna FALSE, FALSE, TRUE, classif.ksvm = 0.316727703199023"
## [1] "Media da coluna FALSE, FALSE, TRUE, classif.randomForest = 0.456151856986097"
## [1] "Media da coluna FALSE, FALSE, TRUE, classif.xgboost = 0.451670509813634"
## [1] "Media da coluna FALSE, TRUE, FALSE, classif.ksvm = 0.186664904350653"
## [1] "Media da coluna FALSE, TRUE, FALSE, classif.randomForest = 0.269628341608909"
## [1] "Media da coluna FALSE, TRUE, FALSE, classif.xgboost = 0.302317138155214"
## [1] "Media da coluna SMOTE, FALSE, FALSE, classif.ksvm = 0.142549319028629"
## [1] "Media da coluna SMOTE, FALSE, FALSE, classif.randomForest = 0.299964908751718"
## [1] "Media da coluna SMOTE, FALSE, FALSE, classif.xgboost = 0.391465990700945"
```

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 = 172.65, 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,]                               TRUE
##  [4,]                              FALSE
##  [5,]                              FALSE
##  [6,]                               TRUE
##  [7,]                               TRUE
```

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

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

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

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

Plotando grafico de Critical Diference

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