R Notebook

Parametros:

Measure = Matthews correlation coefficient
Columns = sampling, weight_space, ruspool, learner
Performance = holdout_measure
Filter keys = NULL
Filter values = NULL

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

Tratamento dos dados

Carregando data set compilado

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

```
##                  learner      weight_space
##  classif.ksvm        :17100   Mode :logical
##  classif.randomForest:17100   FALSE:41040
##  classif.xgboost     :17100   TRUE :10260
##                               NA's :0
##
##
##
##                              measure        sampling      ruspool
##  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.: 0.5924   1st Qu.: 0.3114   1st Qu.: 0.1648
##  Median : 0.9624   Median : 0.8193   Median : 0.5192
##  Mean   : 0.7570   Mean   : 0.6469   Mean   : 0.5099
##  3rd Qu.: 0.9965   3rd Qu.: 0.9879   3rd Qu.: 0.8636
##  Max.   : 1.0000   Max.   : 1.0000   Max.   : 1.0000
##  NA's   :1761      NA's   :1761      NA's   :1761
##  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   :1761    (Other)                  :45900
```

Filtrando pela metrica

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

Filtrando o data set

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

summary(ds)
```

```
##                   learner     weight_space
##  classif.ksvm         :3420   Mode :logical
##  classif.randomForest:3420   FALSE:8208
##  classif.xgboost      :3420   TRUE :2052
##                               NA's :0
##
##
##
##                               measure        sampling     ruspool
##  Accuracy                         :    0   ADASYN:2052   Mode :logical
##  Area under the curve             :    0   FALSE :6156   FALSE:8208
##  F1 measure                       :    0   SMOTE :2052   TRUE :2052
##  G-mean                           :    0                 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.: 0.2088   1st Qu.: 0.0000   1st Qu.: 0.0067
##  Median : 0.7306   Median : 0.4258   Median : 0.1812
##  Mean   : 0.6065   Mean   : 0.4333   Mean   : 0.2883
##  3rd Qu.: 0.9851   3rd Qu.: 0.8098   3rd Qu.: 0.5031
##  Max.   : 1.0000   Max.   : 1.0000   Max.   : 1.0000
##  NA's   :357       NA's   :357       NA's   :357
##  iteration_count                      dataset       imba.rate
##  Min.   :1       abalone                  : 180   Min.   :0.0010
##  1st Qu.:1       adult                    : 180   1st Qu.:0.0100
##  Median :2       bank                     : 180   Median :0.0300
##  Mean   :2       car                      : 180   Mean   :0.0286
##  3rd Qu.:3       cardiotocography-10clases: 180   3rd Qu.:0.0500
##  Max.   :3       cardiotocography-3clases : 180   Max.   :0.0500
##  NA's   :357     (Other)                  :9180
```

Computando as médias das iteracoes

```
ds = group_by(ds, learner , weight_space , measure , sampling , ruspool , 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$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] 228  15
```

```r
# Renomeando a variavel
df = df_tec_wide_residual

summary(df)
```

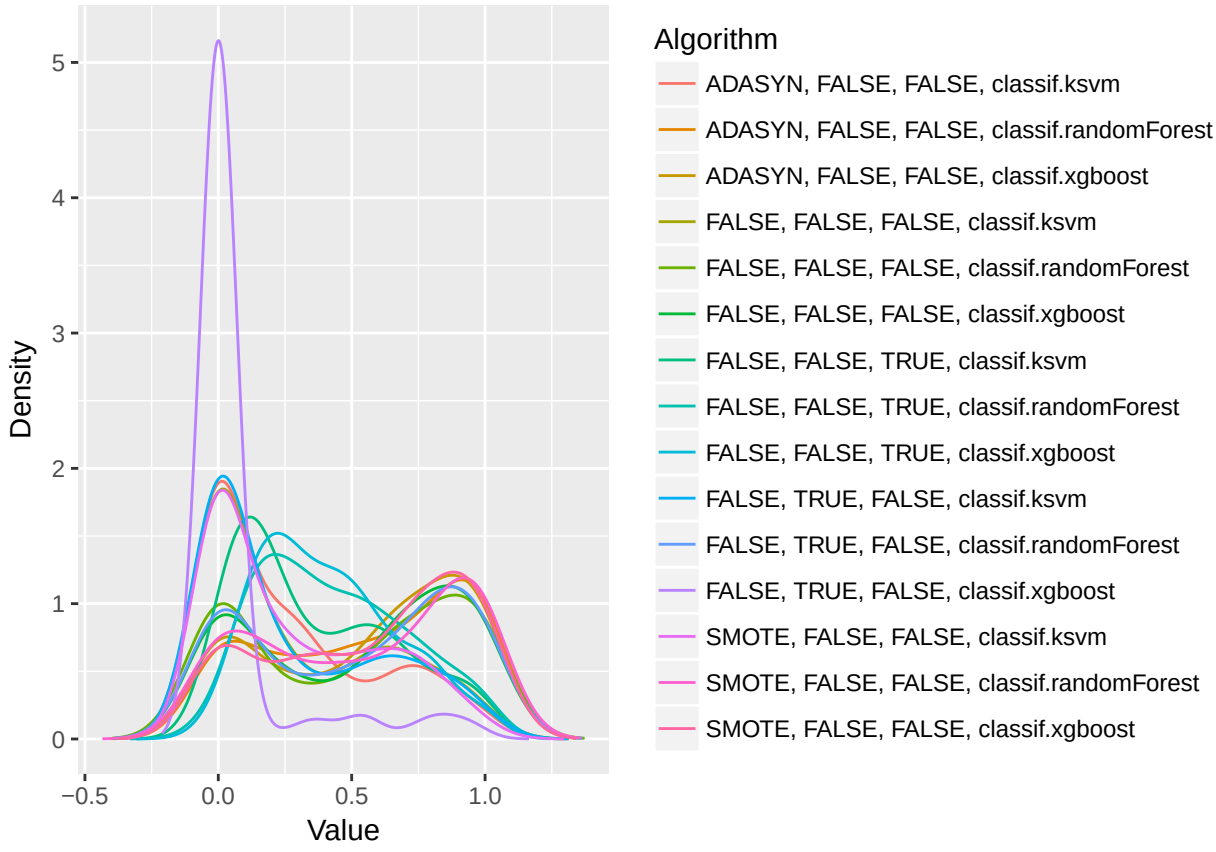
```
##  ADASYN, FALSE, FALSE, classif.ksvm
##  Min.   :-0.06657
##  1st Qu.: 0.00000
##  Median : 0.16917
##  Mean   : 0.27983
##  3rd Qu.: 0.48522
##  Max.   : 1.00000
##  NA's   :7
##  ADASYN, FALSE, FALSE, classif.randomForest
##  Min.   :-0.05198
##  1st Qu.: 0.22992
##  Median : 0.60454
##  Mean   : 0.55386
##  3rd Qu.: 0.89090
##  Max.   : 1.00000
##  NA's   :37
##  ADASYN, FALSE, FALSE, classif.xgboost FALSE, FALSE, FALSE, classif.ksvm
##  Min.   :-0.06053                      Min.   :-0.04044
##  1st Qu.: 0.31469                      1st Qu.: 0.00000
##  Median : 0.67159                      Median : 0.19993
##  Mean   : 0.59303                      Mean   : 0.32962
##  3rd Qu.: 0.90797                      3rd Qu.: 0.63626
##  Max.   : 1.00000                      Max.   : 1.00000
##
##  FALSE, FALSE, FALSE, classif.randomForest
```

```
##  Min.   :-0.02449
##  1st Qu.: 0.08335
##  Median : 0.64741
##  Mean   : 0.53860
##  3rd Qu.: 0.88209
##  Max.   : 1.00000
##  NA's   :8
##  FALSE, FALSE, FALSE, classif.xgboost FALSE, FALSE, TRUE, classif.ksvm
##  Min.   :-0.03192                     Min.   :-0.0266
##  1st Qu.: 0.18970                     1st Qu.: 0.1291
##  Median : 0.66518                     Median : 0.3469
##  Mean   : 0.56520                     Mean   : 0.3941
##  3rd Qu.: 0.88876                     3rd Qu.: 0.6299
##  Max.   : 1.00000                     Max.   : 1.0000
##                                       NA's   :3
##  FALSE, FALSE, TRUE, classif.randomForest
##  Min.   :-0.06927
##  1st Qu.: 0.20348
##  Median : 0.41480
##  Mean   : 0.45300
##  3rd Qu.: 0.66970
##  Max.   : 1.00000
##  NA's   :18
##  FALSE, FALSE, TRUE, classif.xgboost FALSE, TRUE, FALSE, classif.ksvm
##  Min.   :-0.06218                    Min.   :-0.03836
##  1st Qu.: 0.22515                    1st Qu.: 0.00000
##  Median : 0.38111                    Median : 0.19061
##  Mean   : 0.42472                    Mean   : 0.31993
##  3rd Qu.: 0.59979                    3rd Qu.: 0.63475
##  Max.   : 1.00000                    Max.   : 1.00000
##  NA's   :3
##  FALSE, TRUE, FALSE, classif.randomForest
##  Min.   :-0.02177
##  1st Qu.: 0.12029
##  Median : 0.62299
##  Mean   : 0.53799
##  3rd Qu.: 0.88796
##  Max.   : 1.00000
##  NA's   :13
##  FALSE, TRUE, FALSE, classif.xgboost SMOTE, FALSE, FALSE, classif.ksvm
##  Min.   :-0.007648                   Min.   :-0.05605
##  1st Qu.: 0.000000                   1st Qu.: 0.00000
##  Median : 0.000000                   Median : 0.17796
##  Mean   : 0.103749                   Mean   : 0.28889
##  3rd Qu.: 0.000000                   3rd Qu.: 0.55644
##  Max.   : 0.960829                   Max.   : 1.00000
##
##  SMOTE, FALSE, FALSE, classif.randomForest
##  Min.   :-0.0748
##  1st Qu.: 0.1863
##  Median : 0.6367
##  Mean   : 0.5628
##  3rd Qu.: 0.9385
##  Max.   : 1.0000
```

```
##  NA's   :30
##  SMOTE, FALSE, FALSE, classif.xgboost
##  Min.   :-0.03402
##  1st Qu.: 0.31167
##  Median : 0.69208
##  Mean   : 0.59629
##  3rd Qu.: 0.91110
##  Max.   : 1.00000
##
```

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 = 729.36, df = 14, p-value < 2.2e-16
```

Testando as diferencas par a par

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

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

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

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

```
##  [2,]                                TRUE
##  [3,]                               FALSE
##  [4,]                                TRUE
##  [5,]                                TRUE
##  [6,]                               FALSE
##  [7,]                                TRUE
##  [8,]                                TRUE
##  [9,]                                TRUE
## [10,]                                TRUE
## [11,]                                TRUE
## [12,]                                TRUE
## [13,]                                TRUE
## [14,]                                TRUE
## [15,]                               FALSE
```

Plotando grafico de Critical Diference

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