

R Notebook

Parametros:

Measure = Area under the curve
Columns = sampling, weight_space, ruspool, learner
Performance = tuning_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 :10260 FALSE :6156  FALSE:8208  
## F1 measure           : 0 SMOTE :2052  TRUE :2052  
## G-mean              : 0           NA's :0  
## Matthews correlation coefficient: 0  
##  
##  
## tuning_measure  holdout_measure  holdout_measure_residual  
## Min. :0.3023  Min. :0.0000  Min. :0.0000  
## 1st Qu.:0.9030  1st Qu.:0.8213  1st Qu.:0.6821  
## Median :0.9949  Median :0.9770  Median :0.8800  
## Mean :0.9182  Mean :0.8816  Mean :0.8174  
## 3rd Qu.:0.9999  3rd Qu.:0.9996  3rd Qu.:0.9798  
## Max. :1.0000  Max. :1.0000  Max. :1.0000  
## NA's :384    NA's :384    NA's :384  
## 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 :384    (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

```

# 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$performance)))

# 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
```

```

# Removendo linhas com NA's
df_tec_wide_residual = na.omit(df_tec_wide_residual)

# Renomeando a variavel
df = df_tec_wide_residual

summary(df)

```

```

## ADASYN, FALSE, FALSE, classif.ksvm
## Min. :0.7759
## 1st Qu.:0.9990
## Median :1.0000
## Mean :0.9929
## 3rd Qu.:1.0000
## Max. :1.0000
## ADASYN, FALSE, FALSE, classif.randomForest
## Min. :0.7697
## 1st Qu.:0.9989
## Median :0.9999
## Mean :0.9937
## 3rd Qu.:1.0000
## Max. :1.0000
## ADASYN, FALSE, FALSE, classif.xgboost FALSE, FALSE, FALSE, classif.ksvm
## Min. :0.5148 Min. :0.4719
## 1st Qu.:0.9942 1st Qu.:0.7203
## Median :0.9993 Median :0.8956
## Mean :0.9767 Mean :0.8435
## 3rd Qu.:1.0000 3rd Qu.:0.9913
## Max. :1.0000 Max. :1.0000
## FALSE, FALSE, FALSE, classif.randomForest

```

```

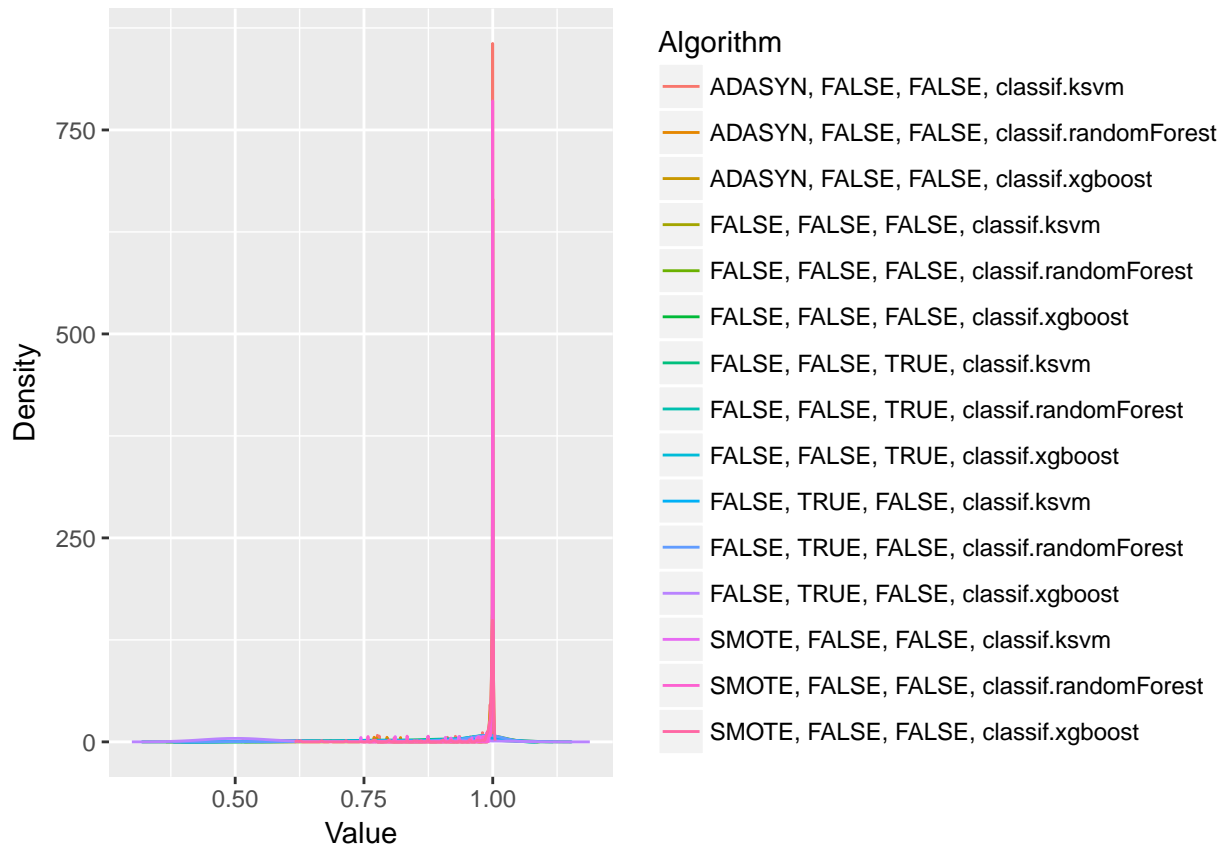
## Min.      :0.4564
## 1st Qu.:0.8717
## Median :0.9757
## Mean    :0.9136
## 3rd Qu.:0.9977
## Max.    :1.0000
## FALSE, FALSE, FALSE, classif.xgboost FALSE, FALSE, TRUE, classif.ksvm
## Min.      :0.4689      Min.      :0.5126
## 1st Qu.:0.8730      1st Qu.:0.7671
## Median :0.9656      Median :0.8719
## Mean    :0.9143      Mean    :0.8481
## 3rd Qu.:0.9956      3rd Qu.:0.9490
## Max.    :1.0000      Max.    :1.0000
## FALSE, FALSE, TRUE, classif.randomForest
## Min.      :0.4610
## 1st Qu.:0.8790
## Median :0.9631
## Mean    :0.9133
## 3rd Qu.:0.9930
## Max.    :1.0000
## FALSE, FALSE, TRUE, classif.xgboost FALSE, TRUE, FALSE, classif.ksvm
## Min.      :0.4862      Min.      :0.4719
## 1st Qu.:0.8730      1st Qu.:0.7092
## Median :0.9546      Median :0.8952
## Mean    :0.9009      Mean    :0.8396
## 3rd Qu.:0.9911      3rd Qu.:0.9913
## Max.    :1.0000      Max.    :1.0000
## FALSE, TRUE, FALSE, classif.randomForest
## Min.      :0.4652
## 1st Qu.:0.8794
## Median :0.9781
## Mean    :0.9124
## 3rd Qu.:0.9980
## Max.    :1.0000
## FALSE, TRUE, FALSE, classif.xgboost SMOTE, FALSE, FALSE, classif.ksvm
## Min.      :0.4886      Min.      :0.7440
## 1st Qu.:0.5000      1st Qu.:0.9987
## Median :0.5000      Median :1.0000
## Mean    :0.6281      Mean    :0.9935
## 3rd Qu.:0.7933      3rd Qu.:1.0000
## Max.    :0.9993      Max.    :1.0000
## SMOTE, FALSE, FALSE, classif.randomForest
## Min.      :0.7577
## 1st Qu.:0.9989
## Median :0.9999
## Mean    :0.9945
## 3rd Qu.:1.0000
## Max.    :1.0000
## SMOTE, FALSE, FALSE, classif.xgboost
## Min.      :0.6201
## 1st Qu.:0.9933
## Median :0.9992
## Mean    :0.9752
## 3rd Qu.:1.0000

```

```
## Max. :1.0000
```

Fazendo teste de normalidade

```
plotDensities(data = df)
```



Testando as diferencas

```
friedmanTest(df)
```

```
##  
## Friedman's rank sum test  
##  
## data: df  
## Friedman's chi-squared = 1637.1, 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,]                                TRUE
## [5,]                                TRUE
## [6,]                                TRUE
## [7,]                                TRUE
## [8,]                                TRUE
## [9,]                                TRUE
## [10,]                               TRUE
## [11,]                               TRUE
## [12,]                               TRUE
## [13,]                               FALSE
## [14,]                               FALSE
## [15,]                               TRUE
##      ADASYN, FALSE, FALSE, classif.randomForest
## [1,]                                FALSE
## [2,]                                FALSE
## [3,]                                TRUE
## [4,]                                TRUE
## [5,]                                TRUE
## [6,]                                TRUE
## [7,]                                TRUE
## [8,]                                TRUE
## [9,]                                TRUE
## [10,]                               TRUE
## [11,]                               TRUE
## [12,]                               TRUE
## [13,]                               FALSE
## [14,]                               FALSE
## [15,]                               TRUE
##      ADASYN, FALSE, FALSE, classif.xgboost
## [1,]                                TRUE
## [2,]                                TRUE
## [3,]                                FALSE
## [4,]                                TRUE
## [5,]                                TRUE
## [6,]                                TRUE
## [7,]                                TRUE
## [8,]                                TRUE
## [9,]                                TRUE
## [10,]                               TRUE
## [11,]                               TRUE
## [12,]                               TRUE
## [13,]                               TRUE
## [14,]                               TRUE
## [15,]                               FALSE
##      FALSE, FALSE, FALSE, classif.ksvm
## [1,]                                TRUE
## [2,]                                TRUE
## [3,]                                TRUE
## [4,]                                FALSE
## [5,]                                TRUE

```

```

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

```

```

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

```



```

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

```

```
## [8,] TRUE
## [9,] TRUE
## [10,] TRUE
## [11,] TRUE
## [12,] TRUE
## [13,] TRUE
## [14,] TRUE
## [15,] FALSE
```

Plotando grafico de Critical Difference

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

