Package ‘mlquantify’

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Description Quantification is a prominent machine learning task that has received an increasing amount of attention in the last years. The objective is to predict the class distribution of a data sample. This package is a collection of machine learning algorithms for class distribution estimation. This package include algorithms from different paradigms of quantification. These methods are described in the paper: A. Maletzke, W. Hassan, D. dos Reis, and G. Batista. The importance of the test set size in quantification assessment. In Proceedings of the Twenty-Ninth International Joint Conference on Artificial Intelligence, IJCAI20, pages 2640–2646, 2020. <doi:10.24963/ijcai.2020/366>.

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ACC Adjusted Classify and Count

Description

It quantifies events based on testing scores using the Adjusted Classify and Count (ACC) method. ACC is an extension of CC, applying a correction rate based on the true and false positive rates (tpr and fpr).

Usage

ACC(test, TprFpr, thr=0.5)

Arguments

test a numeric vector containing the score estimated for the positive class from each test set instance.

TprFpr a data.frame of true positive (tpr) and false positive (fpr) rates estimated on training set, using the function getTPRandFPRbyThreshold().

thr threshold value according to the tpr and fpr were learned. Default is 0.5.

Value

A numeric vector containing the class distribution estimated from the test set.
References


Examples

```r
library(randomForest)
library(caret)
cv <- createFolds(aeAegypti$class, 3)
tr <- aeAegypti[cv$Fold1,
validation <- aeAegypti[cv$Fold2,
ts <- aeAegypti[cv$Fold3,
# -- Getting a sample from ts with 80 positive and 20 negative instances --
ts_sample <- rbind(ts[sample(which(ts$class==1),80),
                   ts[sample(which(ts$class==2),20),])
scorer <- randomForest(class~., data=tr, ntree=500)
scores <- cbind(predict(scorer, validation, type = c("prob")), validation$class)
TprFpr <- getTPRandFPRbyThreshold(scores)
test.scores <- predict(scorer, ts_sample, type = c("prob"))
ACC(test = test.scores[,1], TprFpr = TprFpr)
```

```r
aeAegypti
Males and Females Aedes Aegypti data from Maletzke (2019)
```

Description

Contains events generated by a laser sensor to capture the flight dynamism of insects. It is a binary dataset composed by events from *Aedes Aegypti* Female and Male.

Usage

data(aeAegypti)

Format

The data set `aeAegypti` is a data frame of 1800 observations of 9 variables. Each event is described by the wing beat frequency (wbf), and the frequencies of the first six harmonics obtained when either female or male *Aedes Aegypti* mosquito cross an optical sensor’s line-of-sight. Both male (class = 2) and female (class = 1) of class factor.

Details

The `aeAegypti` dataset is a subset of widely data collection effort involving more than one million instances from 20 different insect species. The dataset was collected varying the temperature and humidity. An observation is associated with a temperature range that varies from 23°C to 35°C.
Author(s)

Andre Maletzke <andregustavom@gmail.com>

References


---

**CC**

*Classify and Count*

---

**Description**

It quantifies events based on testing scores, applying the Classify and Count (CC). CC is the simplest quantification method that derives from classification (Forman, 2005).

**Usage**

`CC(test, thr=0.5)`

**Arguments**

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>test</code></td>
<td>a numeric vector containing the score estimated for the positive class from each test set instance.</td>
</tr>
<tr>
<td><code>thr</code></td>
<td>a numeric value indicating the decision threshold. A value between 0 and 1 (default = 0.5)</td>
</tr>
</tbody>
</table>

**Value**

A numeric vector containing the class distribution estimated from the test set.

**References**

Examples

```r
library(randomForest)
library(caret)
cv <- createFolds(aeAegypti$class, 2)
tr <- aeAegypti[cv$Fold1,]
ts <- aeAegypti[cv$Fold2,]
# -- Getting a sample from ts with 80 positive and 20 negative instances --
ts_sample <- rbind(ts[sample(which(ts$class==1),80),],
                   ts[sample(which(ts$class==2),20),])
scorer <- randomForest(class~., data=tr, ntree=500)
test.scores <- predict(scorer, ts_sample, type = c("prob"))
CC(test = test.scores[,1])
```

---

**DyS Framework**

### Description

DyS is a framework for quantification data based on mixture models method. It quantifies events based on testing scores, applying the DyS framework proposed by Maletzke et al. (2019). It also works with several similarity functions.

### Usage

```r
DyS(p.score, n.score, test, measure="topsoe", bins=seq(2,20,2), err=1e-5)
```

### Arguments

- **p.score**: a numeric vector of positive scores estimated either from a validation set or from a cross-validation method.
- **n.score**: a numeric vector of negative scores estimated either from a validation set or from a cross-validation method.
- **test**: a numeric vector containing the score estimated for the positive class from each test set instance.
- **measure**: measure used to compare the mixture histogram against the histogram obtained from the test set. Several functions can be used (Default: "topsoe", "euclidean", "jensen_difference", "prob_symm", "taneja", "ord").
- **bins**: a numeric vector of number of bins used to construct the histogram for representing the score distribution. (default: seq(2,20,2)).
- **err**: a numeric value defining the accepted error for the ternary search (default: 1e5).

### Value

A numeric vector containing the class distribution estimated from the test set.
References


Examples

```r
library(randomForest)
library(caret)
cv <- createFolds(aeAegypti$class, 3)
tr <- aeAegypti[cv$Fold1,]
validation <- aeAegypti[cv$Fold2,]/ts <- aeAegypti[cv$Fold3,]

# -- Getting a sample from ts with 80 positive and 20 negative instances --
ts_sample <- rbind(ts[sample(which(ts$class==1), 80),], ts[sample(which(ts$class==2), 20),])
scorer <- randomForest(class~., data=tr, ntree=500)
scores <- cbind(predict(scorer, validation, type = c("prob")), validation$class)
test.scores <- predict(scorer, ts_sample, type = c("prob"))
DyS(p.score = scores[scores[,3]==1,1], n.score = scores[scores[,3]==2,1],
test = test.scores[,1])
```

EMQ  
Expectation-Maximization Quantification

Description

This method is an instance of the well-known algorithm for finding maximum-likelihood estimates of the model’s parameters. It quantifies events based on testing scores, applying the Expectation Maximization for Quantification (EMQ) method proposed by Saerens et al. (2002).

Usage

```r
EMQ(train, test, it=5, e=1e-4)
```

Arguments

- `train` a data.frame of the labeled set.
- `test` a numeric matrix of scores predicted from each test set instance. First column must be the positive score.
- `it` maximum number of iteration steps (default 5).
- `e` a numeric value for the stop threshold (default 1e-4). If the difference between two consecutive steps is lower or equal than `e`, the iterative process will be stopped. If `e` is null then the iteration phase is defined by the `it` parameter.
getTPRandFPRbyThreshold

Value
A numeric vector containing the class distribution estimated from the test set.

References

Examples
library(randomForest)
library(caret)

# -- Getting a sample from ts with 80 positive and 20 negative instances --
ts_sample <- rbind(ts[sample(which(ts$class==1),80),],
                   ts[sample(which(ts$class==2),20),])

scorer <- randomForest(class~., data=tr, ntree=500)

EMQ(train=tr, test=test.scores)

getTPRandFPRbyThreshold

Estimates true and false positive rates

Description
This function provides the true and false positive rates (tpr and fpr) for a range of thresholds.

Usage
getTPRandFPRbyThreshold(validation_scores, label_pos = 1, thr_range = seq(0.01,0.99,0.01))

Arguments
validation_scores
data.frame scores estimated from the training set. It should be comprised of three columns (1. positive scores; 2. negative scores; 3.class).

label_pos
numeric value or factor indicating the positive label.

thr_range
a numerical vector of thresholds, ranged between 0 and 1. Default: seq(0.01,0.99,0.01).

Value
data.frame where each row has both (tpr and fpr) rates for each threshold value. This function varies the threshold from 0.01 to 0.99 with increments 0.01.
**HDy_LP**

**HDy with Laplace smoothing**

**Description**

It computes the class distribution using the HDy algorithm proposed by González-Castro et al. (2013) with Laplace smoothing (Maletzke et al. (2019)).

**Usage**

```r
 HDy_LP(p.score, n.score, test)
```

**Arguments**

- **p.score**: a numeric vector of positive scores estimated either from a validation set or from a cross-validation method.
- **n.score**: a numeric vector of negative scores estimated either from a validation set or from a cross-validation method.
- **test**: a numeric vector containing the score estimated for the positive class from each test set instance.

**Value**

A numeric vector containing the class distribution estimated from the test set.

**Author(s)**

Andre Maletzke <andregustavom@gmail.com>
References


Examples

```r
library(randomForest)
library(caret)
cv <- createFolds(aeAegypti$class, 3)
tr <- aeAegypti[cv$Fold1,]
validation <- aeAegypti[cv$Fold2,]
ts <- aeAegypti[cv$Fold3,]

# -- Getting a sample from ts with 80 positive and 20 negative instances --
ts_sample <- rbind(ts[sample(which(ts$class==1),80),],
                    ts[sample(which(ts$class==2),20),])

scorer <- randomForest(class~., data=tr, ntree=500)
scores <- cbind(predict(scorer, validation, type = c("prob")), validation$class)
test.scores <- predict(scorer, ts_sample, type = c("prob"))

HDy_LP(p.score = scores[scores[,3]==1,1], n.score=scores[scores[,3]==2,1],
test=test.scores[,1])
```

---

**KUIPER**

*Quantification method based on Kuiper's test*

**Description**

It quantifies events based on testing scores, applying an adaptation of the Kuiper’s test for quantification problems.

**Usage**

`KUIPER(p.score, n.score, test)`

**Arguments**

- `p.score`: a numeric vector of positive scores estimated either from a validation set or from a cross-validation method.
- `n.score`: a numeric vector of negative scores estimated either from a validation set or from a cross-validation method.
- `test`: a numeric vector containing the score estimated for the positive class from each test set instance.
MAX

Threshold selection method

Description

It quantifies events based on testing scores, applying MAX method, according to Forman (2006). Same as T50, but it sets the threshold where tpr–fpr is maximized.

Usage

MAX(test, TprFpr)

Arguments

test a numeric vector containing the score estimated for the positive class from each test set instance.

TprFpr a data.frame of true positive (tpr) and false positive (fpr) rates estimated on training set, using the function getTPRandFPRbyThreshold().

Value

A numeric vector containing the class distribution estimated from the test set.
References


Examples

```r
library(randomForest)
library(caret)

# Create folds
cv <- createFolds(aeAegypti$class, 3)
tr <- aeAegypti[cv$Fold1,]
validation <- aeAegypti[cv$Fold2,]
ts <- aeAegypti[cv$Fold3,]

# Get a sample of 80 positive and 20 negative instances
ts_sample <- rbind(ts[sample(which(ts$class==1),80),],
                    ts[sample(which(ts$class==2),20),])

# Define the model
scorer <- randomForest(class~., data=tr, ntree=500)
scores <- cbind(predict(scorer, validation, type = c("prob")), validation$class)

# Get TPR and FPR by threshold
TprFpr <- getTPRandFPRbyThreshold(scores)

# Predict for test set instances
MAX(test=test.scores[,1], TprFpr=TprFpr)
```

---

**MKS**

*Mixable Kolmogorov Smirnov*

Description

It quantifies events based on testing scores, applying the Mixable Kolmogorov Smirnov (MKS) method proposed by Maletzke et al. (2019).

Usage

```r
MKS(p.score, n.score, test)
```

Arguments

- **p.score**: a numeric vector of positive scores estimated either from a validation set or from a cross-validation method.
- **n.score**: a numeric vector of negative scores estimated either from a validation set or from a cross-validation method.
- **test**: a numeric vector containing the score estimated for the positive class from each test set instance.

Value

A numeric vector containing the class distribution estimated from the test set.
References


Examples

```r
library(randomForest)
library(caret)
cv <- createFolds(aeAegypti$Class, 3)
tr <- aeAegypti[cv$Fold1,]
validation <- aeAegypti[cv$Fold2,]
ts <- aeAegypti[cv$Fold3,]

# -- Getting a sample from ts with 80 positive and 20 negative instances --
ts_sample <- rbind(ts[sample(which(ts$Class==1),80),],
                   ts[sample(which(ts$Class==2),20),])
scorer <- randomForest(Class~., data=tr, ntree=500)
scores <- cbind(predict(scorer, validation, type = c("prob")), validation$Class)
test.scores <- predict(scorer, ts_sample, type = c("prob"))
MKS(p.score = scores[scores[,3]==1,1], n.score = scores[scores[,3]==2,1],
    test = test.scores)
```

---

**MS**

Median Sweep

---

### Description

It quantifies events based on testing scores, applying Median Sweep (MS) method, according to Forman (2006).

### Usage

```r
MS(test, TprFpr)
```

### Arguments

- **test**
  
a numeric vector containing the score estimated for the positive class from each test set instance.

- **TprFpr**
  
a data.frame of true positive (tpr) and false positive (fpr) rates estimated on training set, using the function getTPRandFPRbyThreshold().

### Value

A numeric vector containing the class distribution estimated from the test set.
References


Examples

```r
library(randomForest)
library(caret)
cv <- createFolds(aeAegypti$class, 3)
tr <- aeAegypti[cv$Fold1,]
validation <- aeAegypti[cv$Fold2,]
ts <- aeAegypti[cv$Fold3,]

# -- Getting a sample from ts with 80 positive and 20 negative instances --
ts_sample <- rbind(ts[sample(which(ts$class==1),80),],
                  ts[sample(which(ts$class==2),20),])
scorer <- randomForest(class~., data=tr, ntree=500)
scores <- cbind(predict(scorer, validation, type = c("prob")), validation$class)
TprFpr <- getTPRandFPRbyThreshold(scores)
test.scores <- predict(scorer, ts_sample, type = c("prob"))
MS(test = test.scores[,1], TprFpr = TprFpr)
```

---

### MS2

**Threshold selection method. Median Sweep**

**Description**

It quantifies events using a modified version of the MS method that considers only thresholds where the denominator (tpr-fpr) is greater than 0.25.

**Usage**

```r
MS2(test, TprFpr)
```

**Arguments**

- **test**
  - a numeric vector containing the score estimated for the positive class from each test set instance.

- **TprFpr**
  - a data.frame of true positive (tpr) and false positive (fpr) rates estimated on training set, using the function `getTPRandFPRbyThreshold()`.

**Value**

A numeric vector containing the class distribution estimated from the test set.
References


Examples

```r
library(randomForest)
library(caret)
cv <- createFolds(aeAegypti$class, 3)
tr <- aeAegypti[cv$Fold1,]
validation <- aeAegypti[cv$Fold2,]
ts <- aeAegypti[cv$Fold3,]

# -- Getting a sample from ts with 80 positive and 20 negative instances --
ts_sample <- rbind(ts[sample(which(ts$class==1),80),],
                    ts[sample(which(ts$class==2),20),])
scorer <- randomForest(class~., data=tr, ntree=500)
scores <- cbind(predict(scorer, validation, type = c("prob")), validation$class)
TprFpr <- getTPRandFPRbyThreshold(scores)
test.scores <- predict(scorer, ts_sample, type = c("prob"))
MS2(test = test.scores[,1], TprFpr = TprFpr)
```

PACC

**Probabilistic Adjusted Classify and Count**

Description

It quantifies events based on testing scores, applying the Probabilistic Adjusted Classify and Count (PACC) method. This method is also called Scaled Probability Average (SPA).

Usage

```r
PACC(test, TprFpr, thr=0.5)
```

Arguments

- `test`  
  a numeric vector containing the score estimated for the positive class from each test set instance. (NOTE: It requires calibrated scores. See `calibrate` from `CORElearn`).

- `TprFpr`  
  a data.frame of true positive (tpr) and false positive (fpr) rates estimated on training set, using the function `getTPRandFPRbyThreshold()`.

- `thr`  
  threshold value according to the tpr and fpr were learned. Default is 0.5.

Value

A numeric vector containing the class distribution estimated from the test set.
References


Examples

```r
library(randomForest)
library(caret)
cv <- createFolds(aeAegypti$class, 3)
tr <- aeAegypti[cv$Fold1,]
validation <- aeAegypti[cv$Fold2,]
ts <- aeAegypti[cv$Fold3,]

# -- Getting a sample from ts with 80 positive and 20 negative instances --
ts_sample <- rbind(ts[ts$class==1,][sample(which(ts$class==1),80),],
                   ts[ts$class==2,][sample(which(ts$class==2),20),])

scorer <- randomForest(class~., data=tr, ntree=500)
scores <- cbind(predict(scorer, validation, type = c("prob")), validation$class)

TprFpr <- getTPRandFPRbyThreshold(scores)
test.scores <- predict(scorer, ts_sample, type = c("prob"))[,1]

# -- PACC requires calibrated scores. Be aware of doing this before using PACC --
# -- You can make it using calibrate function from the CORElearn package --
# if(requireNamespace("CORElearn")){
#   cal_tr <- CORElearn::calibrate(as.factor(scores[,3]), scores[,1], class1=1,
#                                   method="isoReg",assumeProbabilities=TRUE)
#   test.scores <- CORElearn::applyCalibration(test.scores, cal_tr)
#}
PACC(test = test.scores, TprFpr = TprFpr)
```

---

### PCC

**Probabilistic Classify and Count**

**Description**

It quantifies events based on testing scores, applying the Probabilistic Classify and Count (PCC) method.

**Usage**

```r
PCC(test)
```

**Arguments**

- `test`: a numeric vector containing the score estimated for the positive class from each test set instance. (NOTE: It requires calibrated scores. See `calibrate` from `CORElearn`).
**Value**

A numeric vector containing the class distribution estimated from the test set.

**References**


**Examples**

```r
library(randomForest)
library(caret)
cv <- createFolds(aeAegypti$class, 3)
tr <- aeAegypti[cv$Fold1,]
validation <- aeAegypti[cv$Fold2,]
ts <- aeAegypti[cv$Fold3,]

# -- Getting a sample from ts with 80 positive and 20 negative instances --
ts_sample <- rbind(ts[sample(which(ts$class==1),80),],
                   ts[sample(which(ts$class==2),20),])
scorer <- randomForest(class~., data=tr, ntree=500)
scores <- cbind(predict(scorer, validation, type = c("prob")), validation$class)
test.scores <- predict(scorer, ts_sample, type = c("prob"))[[,1]]

# -- PCC requires calibrated scores. Be aware of doing this before using PCC --
# -- You can make it using calibrate function from the CORElearn package --
# if(requireNamespace("CORElearn")){
#   cal_tr <- CORElearn::calibrate(as.factor(scores[,3]), scores[,1], class1=1,
#     method="isoReg",assumeProbabilities=TRUE)
#   test.scores <- CORElearn::applyCalibration(test.scores, cal_tr)
# }
PCC(test=test.scores)
```

**Description**

It is a nearest-neighbor classifier adapted for working over quantification problems. This method applies a weighting scheme, reducing the weight on neighbors from the majority class.

**Usage**

PWK(train, y, test, alpha=1, n_neighbors=10)
Arguments

- **train**: a data.frame containing the training data.
- **y**: a vector containing the target values.
- **test**: a data.frame containing the test data.
- **alpha**: a numeric value defining the proportion-weighted k-nearest neighbor algorithm as proposed by Barranquero et al., (2012). (Default: 1).
- **n_neighbors**: a integer value defining the number of neighbors to use by default for nearest neighbor queries (Default: 10).

Value

A numeric vector containing the class distribution estimated from the test set.

References


Examples

```r
library(caret)
library(FNN)
cv <- createFolds(aeAegypti$class, 2)
tr <- aeAegypti[cv$Fold1,]
ts <- aeAegypti[cv$Fold2,]

# -- Getting a sample from ts with 80 positive and 20 negative instances --
ts_sample <- rbind(ts[sample(which(ts$class==1),80),],
t[sample(which(ts$class==2),20),])
PWK(train=tr,-which(names(tr)=="class"), y=tr[,]class", test= ts,-which(names(ts)=="class")])
```

---

**SMM**  
*Sample Mean Matching*

Description

SMM is a member of the DyS framework that uses simple means scores to represent the score distribution for positive, negative, and unlabelled scores. Therefore, the class distribution is given by a closed-form equation.

Usage

```r
SMM(p.score, n.score, test)
```
Arguments

p.score a numeric vector of positive scores estimated either from a validation set or from a cross-validation method.
n.score a numeric vector of negative scores estimated either from a validation set or from a cross-validation method.
test a numeric vector containing the score estimated for the positive class from each test set instance.

Value

A numeric vector containing the class distribution estimated from the test set.

References


Examples

```r
library(randomForest)
library(caret)
cv <- createFolds(aeAegypti$class, 3)
tr <- aeAegypti[cv$Fold1,]
validation <- aeAegypti[cv$Fold2,]
ts <- aeAegypti[cv$Fold3,]

# -- Getting a sample from ts with 80 positive and 20 negative instances --
ts_sample <- rbind(ts[sample(which(ts$class==1),80),],
                 ts[sample(which(ts$class==2),20),])
scorer <- randomForest(class~., data=tr, ntree=500)
scores <- cbind(predict(scorer, validation, type = c("prob")), validation$class)
test.scores <- predict(scorer, ts_sample, type = c("prob"))
SMM(p.score = scores[scores[,3]==1,1], n.score = scores[scores[,3]==2,1],
    test = test.scores[,1])
```

---

**SORD**  
*Sample ORD Dissimilarity*

Description

It quantifies events based on testing scores applying the framework DyS with the Sample ORD Dissimilarity (SORD) proposed by Maletzke et al. (2019).

Usage

```
SORD(p.score, n.score, test)
```
**Arguments**

- **p.score**
  a numeric vector of positive scores estimated either from a validation set or from a cross-validation method.

- **n.score**
  a numeric vector of negative scores estimated either from a validation set or from a cross-validation method.

- **test**
  a numeric vector containing the score estimated for the positive class from each test set instance.

**Value**

A numeric vector containing the class distribution estimated from the test set.

**References**


**Examples**

```r
cv <- createFolds(aeAegypti$class, 3)
tr <- aeAegypti[cv$Fold1,]
validation <- aeAegypti[cv$Fold2,]
ts <- aeAegypti[cv$Fold3,]

# -- Getting a sample from ts with 80 positive and 20 negative instances --
ts_sample <- rbind(ts[sample(which(ts$class==1),80),],
                     ts[sample(which(ts$class==2),20),])

scorer <- randomForest(class~., data=tr, ntree=500)
scores <- cbind(predict(scorer, validation, type = c("prob")), validation$class)
test.scores <- predict(scorer, ts_sample, type = c("prob"))
SORD(p.score = scores[scores[,3]==1,1], n.score = scores[scores[,3]==2,1],
     test = test.scores[,1])
```

---

**T50**

 Threshold selection method

**Description**

It quantifies events based on testing scores, applying T50 method proposed by Forman (2006). It sets the decision threshold of Binary Classifier where tpr = 50%.

**Usage**

```r
T50(test, TprFpr)
```
Arguments

- **test**: a numeric vector containing the score estimated for the positive class from each test set instance.
- **TprFpr**: a data.frame of true positive (tpr) and false positive (fpr) rates estimated on training set, using the function `getTPRandFPRbyThreshold()`.

Value

A numeric vector containing the class distribution estimated from the test set.

References


Examples

```r
library(randomForest)
library(caret)
cv <- createFolds(aeAegypti$class, 3)
tr <- aeAegypti[cv$Fold1,]
validation <- aeAegypti[cv$Fold2,]
ts <- aeAegypti[cv$Fold3,]
# -- Getting a sample from ts with 80 positive and 20 negative instances --
ts_sample <- rbind(ts[sample(which(ts$class==1),80),],
                   ts[sample(which(ts$class==2),20),])
scorer <- randomForest(class~., data=tr, ntree=500)
scores <- cbind(predict(scorer, validation, type = c("prob")), validation$class)
TprFpr <- getTPRandFPRbyThreshold(scores)
test.scores <- predict(scorer, ts_sample, type = c("prob"))
T50(test=test.scores[,1], TprFpr=TprFpr)
```

---

**X**

*Threshold selection method*

Description

It quantifies events based on testing scores, applying the X method (Forman, 2006). Same as T50, but set the threshold where \((1 - tpr) = fpr\).

Usage

`X(test, TprFpr)`
**Arguments**

- **test**: a numeric vector containing the score estimated for the positive class from each test set instance.
- **TprFpr**: a data.frame of true positive (tpr) and false positive (fpr) rates estimated on training set, using the function `getTPRandFPRbyThreshold()`.

**Value**

A numeric vector containing the class distribution estimated from the test set.

**References**


**Examples**

```r
library(randomForest)
library(caret)
cv <- createFolds(aeAegypti$class, 3)
tr <- aeAegypti[cv$Fold1,]
validation <- aeAegypti[cv$Fold2,]/ts <- aeAegypti[cv$Fold3,]

# -- Getting a sample from ts with 80 positive and 20 negative instances --
ts_sample <- rbind(ts[sample(which(ts$class==1),80),],
                  ts[sample(which(ts$class==2),20),])
scorer <- randomForest(class~., data=tr, ntree=500)
scores <- cbind(predict(scorer, validation, type = c("prob")), validation$class)
TprFpr <- getTPRandFPRbyThreshold(scores)
test.scores <- predict(scorer, ts_sample, type = c("prob"))
X(test=test.scores[,1], TprFpr=TprFpr)
```
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