Package: evabic (via r-universe)

September 9, 2024

Title Evaluation of Binary Classifiers

Version 0.1.1

Description Evaluates the performance of binary classifiers. Computes confusion measures (TP, TN, FP, FN), derived measures (TPR, FDR, accuracy, F1, DOR, ..), and area under the curve. Outputs are well suited for nested dataframes.

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URL https://abichat.github.io/evabic/, https://github.com/abichat/evabic

BugReports https://github.com/abichat/evabic/issues

Suggests testthat (>= 2.1.0)

Encoding UTF-8

Language en-US

Roxygen list(markdown = TRUE)

RoxygenNote 7.2.1

Repository https://abichat.r-universe.dev

RemoteUrl https://github.com/abichat/evabic

RemoteRef HEAD

RemoteSha 128b2ee5a57f703df607b5c3ed21ca754cdf1055

Contents

add_names *Add names to a vector*

Description

Add names to a vector, with default names.

Usage

```
add_names(x, names = NULL, prefix = "x")
```

Arguments

x	A vector.
names	Vector of names to add. If NULL, default names are added.
prefix	The prefix to add before default names. Useful only if names is set to NULL.

Value

A named vector

Examples

```
add_names(month.name)
```

ebc_allmeasures *Available measures*

Description

Available measures in evabic

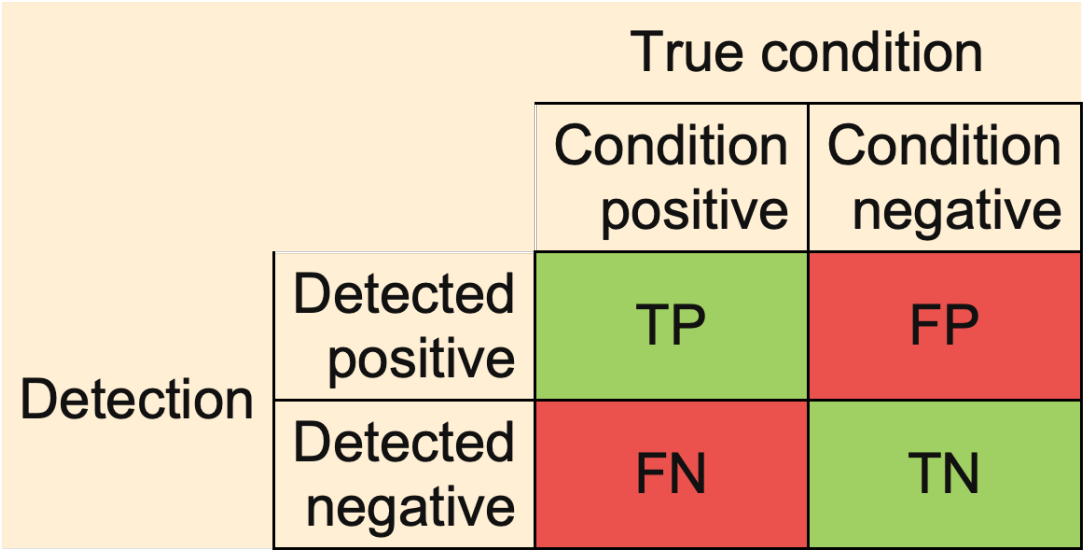
Usage

```
ebc_allmeasures
```

Format

An object of class character of length 18.

Details



TP True Positive

FP False Positive

FN False Negative

TN True Negative

TPR True Positive Rate or Sensitivity or Recall or Power

$$TPR = \frac{TP}{TP + FN} = 1 - FNR$$

TNR True Negative Rate or Specificity

$$TNR = \frac{TN}{FP + TN} = 1 - FPR$$

PPV Positive Predictive Value or Precision

$$PPV = \frac{TP}{TP + FP} = 1 - FDR$$

NPV Negative Predictive Value

$$NPV = \frac{TN}{TN + FN} = 1 - FOR$$

FNR False Negative Rate or Type II Error Rate or Miss Rate

$$FNR = \frac{FN}{TP + FN} = 1 - TPR$$

FPR False Positive Rate or Type I Errors Rate or Fall-out

$$FPR = \frac{FP}{FP + TN} = 1 - TNR$$

FDR False Discovery Rate

$$FDR = \frac{FP}{FP + TP} = 1 - PPV$$

FOR False Omission Rate

$$FOR = \frac{FN}{TN + FN} = 1 - NPV$$

ACC Accuracy

$$ACC = \frac{TP + TN}{TP + FP + FN + TN}$$

BACC Balanced Accuracy

$$BACC = \frac{\frac{TP}{TP+FN} + \frac{TN}{FP+TN}}{2}$$

F1 F1 Score

$$F1 = \frac{2TP}{2TP + FP + FN} = \frac{2}{\frac{1}{TPR} + \frac{1}{PPV}}$$

PLR Positive Likelihood Ratio or LR+ or Likelihood Ratio for Positive Results

$$PLR = \frac{TPR}{1 - TNR}$$

NLR Negative Likelihood Ratio or LR- or Likelihood Ratio for Negative Results

$$NLR = \frac{1 - TPR}{TNR}$$

DOR Diagnostic Odds Ratio

$$DOR = \frac{\frac{TP}{FP}}{\frac{FN}{TN}} = \frac{PLR}{NLR}$$

References

https://en.wikipedia.org/wiki/Evaluation_of_binary_classifiers

Examples

```
ebc_allmeasures
```

ebc_AUC *Area under the curve*

Description

Compute the Area Under the Curve for a classification.

Usage

```
ebc_AUC(
  detection_values,
  true,
  all,
  m = length(all),
  direction = c("<", ">", "<=", ">=")
)

ebc_AUC_from_measures(df_measures)
```

Arguments

detection_values	Values corresponding to elements that are detected. Must be named.
true	Vector of element that are supposed to be detected.
all	Vector of all elements.
m	Total number of elements.
direction	With < (default), detected elements are those which are strictly less than the threshold. Could be change to ">", <= or >=.
df_measures	A dataframe with TPR and FRP columns. E.g. the output of ebc_tidy_by_threshold.

Value

A numeric.

Examples

```
set.seed(42)
X1 <- rnorm(50)
X2 <- rnorm(50)
X3 <- rnorm(50)
predictors <- paste0("X", 1:3)
df_lm <- data.frame(X1 = X1, X2 = X2, X3 = X3,
                    X4 = X1 + X2 + X3 + rnorm(50, sd = 0.5),
                    X5 = X1 + 3 * X3 + rnorm(50, sd = 0.5),
                    X6 = X2 - 2 * X3 + rnorm(50, sd = 0.5),
                    X7 = X1 - X2 + rnorm(50, sd = 2),
                    Y  = X1 - X2 + 3 * X3 + rnorm(50))
```

```
model <- lm(Y ~ ., data = df_lm)
pvalues <- summary(model)$coefficients[-1, 4]
ebc_AUC(pvalues, predictors, m = 7)

df_measures <- ebc_tidy_by_threshold(pvalues, predictors, m = 7)
ebc_AUC_from_measures(df_measures)
```

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ebc_confusion *Confusion matrix*

Description

Compute the the confusion matrix

Usage

```
ebc_confusion(detected, true, all, m = length(all), prop = FALSE)
```

Arguments

detected	Vector of elements that are detected.
true	Vector of element that are supposed to be detected.
all	Vector of all elements.
m	Total number of elements.
prop	Logical, default to FALSE. Should the matrix sum to one?

Details

See ebc_allmeasures for the description of the measures.

Value

A 2*2 named matrix.

Examples

```
ebc_confusion(detected = c("A", "C", "D"), true = c("A", "B", "C"), m = 6)
```

ebc_tidy *Tidy output for measures*

Description

Construct a single row summary of the classifier.

Usage

```
ebc_tidy(
  detected,
  true,
  all,
  m = length(all),
  measures = c("TPR", "FPR", "FDR", "ACC", "F1")
)
```

Arguments

detected	Vector of elements that are detected.
true	Vector of element that are supposed to be detected.
all	Vector of all elements.
m	Total number of elements.
measures	Desired measures of performance.

Details

See ebc_allmeasures for the available measures and their descriptions.

Value

A single-row data.frame with one column per element in measures.

See Also

ebc_TP, ebc_TPR, ebc_allmeasures

Examples

```
ebc_tidy(detected = c("A", "C", "D"), true = c("A", "B", "C"),
         all = LETTERS[1:6], measures = c("ACC", "FDR"))
```

`ebc_tidy_by_threshold` *Measures by threshold*

Description

Computes measures according to a moving threshold.

Usage

```
ebc_tidy_by_threshold(
  detection_values,
  true,
  all,
  m = length(all),
  measures = c("TPR", "FPR", "FDR", "ACC", "F1"),
  direction = c("<", ">", "<=", ">=")
)
```

Arguments

`detection_values`	Values corresponding to elements that are detected. Must be named.
`true`	Vector of element that are supposed to be detected.
`all`	Vector of all elements.
`m`	Total number of elements.
`measures`	Desired measures of performance.
`direction`	With < (default), detected elements are those which are strictly less than the threshold. Could be change to ">", <= or >=.

Details

See `ebc_allmeasures` for the available measures and their descriptions.

Value

A dataframe with one column called threshold and other corresponding to those specified in `measures`.

Examples

```
set.seed(42)
X1 <- rnorm(50)
X2 <- rnorm(50)
X3 <- rnorm(50)
predictors <- paste0("X", 1:3)
df_lm <- data.frame(X1 = X1, X2 = X2, X3 = X3,
                    X4 = X1 + X2 + X3 + rnorm(50, sd = 0.5),
                    X5 = X1 + 3 * X3 + rnorm(50, sd = 0.5),
```

```
                    X6 = X2 - 2 * X3 + rnorm(50, sd = 0.5),
                    X7 = X1 - X2 + rnorm(50, sd = 2),
                    Y  = X1 - X2 + 3 * X3 + rnorm(50))
model <- lm(Y ~ ., data = df_lm)
pvalues <- summary(model)$coefficients[-1, 4]
ebc_tidy_by_threshold(pvalues, predictors, m = 7)
```

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ebc_TP *Confusion measures.*

Description

Basic measures from the confusion matrix.

Usage

```
ebc_TP(detected, true)

ebc_FP(detected, true)

ebc_FN(detected, true)

ebc_TN(detected, true, all, m = length(all))
```

Arguments

detected	Vector of elements that are detected.
true	Vector of element that are supposed to be detected.
all	Vector of all elements.
m	Total number of elements.

Details

See ebc_allmeasures for the description of the measures.

Value

An integer.

See Also

ebc_TPR, ebc_tidy, ebc_allmeasures

Examples

```
ebc_TP(detected = c("A", "C", "D"), true = c("A", "B", "C"))
ebc_FP(detected = c("A", "C", "D"), true = c("A", "B", "C"))
ebc_FN(detected = c("A", "C", "D"), true = c("A", "B", "C"))
ebc_TN(detected = c("A", "C", "D"), true = c("A", "B", "C"),
       all = LETTERS[1:6])
ebc_TN(detected = c("A", "C", "D"), true = c("A", "B", "C"), m = 6)
```

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ebc_TPR *Derived measures.*

Description

Measures derived from confusion matrix.

Usage

```
ebc_TPR(detected, true)

ebc_TNR(detected, true, all, m = length(all))

ebc_PPV(detected, true)

ebc_NPV(detected, true, all, m = length(all))

ebc_FNR(detected, true)

ebc_FPR(detected, true, all, m = length(all))

ebc_FDR(detected, true)

ebc_FOR(detected, true, all, m = length(all))

ebc_ACC(detected, true, all, m = length(all))

ebc_BACC(detected, true, all, m = length(all))

ebc_F1(detected, true)

ebc_PLR(detected, true, all, m = length(all))

ebc_NLR(detected, true, all, m = length(all))

ebc_DOR(detected, true, all, m = length(all))
```

Arguments

detected	Vector of elements that are detected.
true	Vector of element that are supposed to be detected.
all	Vector of all elements.
m	Total number of elements.

Details

See ebc_allmeasures for the description of the measures.

Value

A numeric.

See Also

ebc_TP, ebc_tidy, ebc_allmeasures

Examples

```
ebc_TPR(detected = c("A", "C", "D"), true = c("A", "B", "C"))
ebc_ACC(detected = c("A", "C", "D"), true = c("A", "B", "C"),
        all = LETTERS[1:5])
```

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