

Package ‘mlr3measures’

November 5, 2019

Title Performance Measures for 'mlr3'

Version 0.1.1

Description Implements multiple performance measures for supervised learning. Includes over 40 measures for regression and classification. Additionally, meta information about the performance measures can be queried, e.g. what the best and worst possible performances scores are.

License LGPL-3

URL <https://mlr3measures.mlr-org.com>,
<https://github.com/mlr-org/mlr3measures>

BugReports <https://github.com/mlr-org/mlr3measures/issues>

Depends R (>= 3.1.0)

Imports checkmate

Suggests bibtex, testthat

Encoding UTF-8

RoxygenNote 6.1.1

Collate 'assertions.R' 'measures.R' 'binary_auc.R' 'binary_dor.R'
'binary_fbeta.R' 'binary_fdr.R' 'binary_fn.R' 'binary_fnr.R'
'binary_fomr.R' 'binary_fp.R' 'binary_fpr.R' 'binary_mcc.R'
'binary_npv.R' 'binary_ppv.R' 'binary_tn.R' 'binary_tnr.R'
'binary_tp.R' 'binary_tpr.R' 'classif_acc.R' 'classif_bacc.R'
'classif_ce.R' 'classif_logloss.R' 'confusion_matrix.R'
'helper.R' 'regr_bias.R' 'regr_ktau.R' 'regr_mae.R'
'regr_mape.R' 'regr_maxae.R' 'regr_maxse.R' 'regr_medae.R'
'regr_medse.R' 'regr_mse.R' 'regr_msle.R' 'regr_pbias.R'
'regr_rael.R' 'regr_rmse.R' 'regr_rmsle.R' 'regr_rrse.R'
'regr_rse.R' 'regr_rsqr.R' 'regr_sae.R' 'regr_smape.R'
'regr_srho.R' 'regr_sse.R' 'roxygen.R' 'zzz.R'

NeedsCompilation no

Author Michel Lang [cre, aut] (<<https://orcid.org/0000-0001-9754-0393>>)

Maintainer Michel Lang <michellang@gmail.com>

Repository CRAN

Date/Publication 2019-11-05 07:50:02 UTC

R topics documented:

mlr3measures-package	3
acc	3
auc	4
bacc	5
bias	7
ce	8
confusion_matrix	9
dor	10
fbeta	11
fdr	13
fn	14
fnr	15
fomr	17
fp	18
fpr	19
ktau	21
logloss	22
mae	23
mape	24
maxae	25
maxse	26
mcc	27
measures	28
medae	29
medse	30
mse	31
msle	32
npv	33
pbias	34
ppv	35
rae	37
rmse	38
rmsle	39
rrse	40
rse	41
rsq	42
sae	44
smape	45
srho	46
sse	47
tn	48
tnr	49

Value

Performance value as `numeric(1)`.

Meta Information

- Type: "classif"
- Range: [0, 1]
- Minimize: FALSE
- Required prediction: response

See Also

Other Classification Measures: [bacc](#), [ce](#), [logloss](#)

Examples

```
set.seed(1)
lvls = c("a", "b", "c")
truth = factor(sample(lvls, 10, replace = TRUE), levels = lvls)
response = factor(sample(lvls, 10, replace = TRUE), levels = lvls)
acc(truth, response)
```

auc

Area Under the ROC Curve

Description

Computes the area under the Receiver Operator Characteristic (ROC) curve. The AUC can be interpreted as the probability that a randomly chosen positive observation has a higher predicted probability than a randomly chosen negative observation.

Usage

```
auc(truth, prob, positive, na_value = NaN, ...)
```

Arguments

<code>truth</code>	:: <code>factor()</code> True (observed) labels. Must have the exactly same two levels and the same length as response.
<code>prob</code>	:: <code>numeric()</code> Predicted probability for positive class. Must have exactly same length as truth.
<code>positive</code>	:: <code>character(1)</code> Name of the positive class.
<code>na_value</code>	:: <code>numeric(1)</code> Value that should be returned if the measure is not defined for the input (as described in the note). Default is NaN.

... :: any
Additional arguments. Currently ignored.

Value

Performance value as `numeric(1)`.

Meta Information

- Type: "binary"
- Range: [0, 1]
- Minimize: FALSE
- Required prediction: prob

Note

This measure is undefined if the true values are either all positive or all negative.

References

Youden WJ (1950). "Index for rating diagnostic tests." *Cancer*, 3(1), 32–35. doi: [10.1002/1097-0142\(1950\)3:1<32::aidcncr2820030106>3.0.co;23](https://doi.org/10.1002/1097-0142(1950)3:1<32::aidcncr2820030106>3.0.co;23).

See Also

Other Binary Classification Measures: [dor](#), [fbeta](#), [fdr](#), [fnr](#), [fn](#), [fomr](#), [fpr](#), [fp](#), [mcc](#), [npv](#), [ppv](#), [tnr](#), [tn](#), [tpr](#), [tp](#)

Examples

```
truth = factor(c("a", "a", "a", "b"))
prob = c(.6, .7, .1, .4)
auc(truth, prob, "a")
```

bacc

Balanced Accuracy

Description

Computes the weighted balanced accuracy, suitable for imbalanced data sets. It is defined analogously to the definition in [sklearn](#).

First, the sample weights w are normalized per class:

$$\hat{w}_i = \frac{w_i}{\sum_j 1(y_j = y_i)w_i}.$$

The balanced accuracy is calculated as

$$\frac{1}{\sum_i \hat{w}_i} \sum_i 1(r_i = t_i)\hat{w}_i.$$

Usage

```
bacc(truth, response, sample_weights = NULL, ...)
```

Arguments

```
truth          :: factor()
                True (observed) labels. Must have the same levels and length as response.

response       :: factor()
                Predicted response labels. Must have the same levels and length as truth.

sample_weights :: numeric()
                Non-negative sample weights. Must have the same levels and length as truth.
                Defaults to equal sample weights.

...           :: any
                Additional arguments. Currently ignored.
```

Value

Performance value as `numeric(1)`.

Meta Information

- Type: "classif"
- Range: [0, 1]
- Minimize: FALSE
- Required prediction: response

References

Brodersen KH, Ong CS, Stephan KE, Buhmann JM (2010). "The Balanced Accuracy and Its Posterior Distribution." In *2010 20th International Conference on Pattern Recognition*. doi: [10.1109/icpr.2010.764](https://doi.org/10.1109/icpr.2010.764).

Guyon I, Bennett K, Cawley G, Escalante HJ, Escalera S, Ho TK, Macia N, Ray B, Saeed M, Statnikov A, Viegas E (2015). "Design of the 2015 ChaLearn AutoML challenge." In *2015 International Joint Conference on Neural Networks (IJCNN)*. doi: [10.1109/ijcnn.2015.7280767](https://doi.org/10.1109/ijcnn.2015.7280767).

See Also

Other Classification Measures: [acc](#), [ce](#), [logloss](#)

Examples

```
set.seed(1)
lvls = c("a", "b", "c")
truth = factor(sample(lvls, 10, replace = TRUE), levels = lvls)
response = factor(sample(lvls, 10, replace = TRUE), levels = lvls)
bacc(truth, response)
```

bias

Bias

Description

Regression measure defined as

$$\frac{1}{n} \sum_{i=1}^n (t_i - r_i).$$

Good predictions score close to 0.

Usage

```
bias(truth, response, ...)
```

Arguments

truth	:: numeric()	True (observed) values. Must have the same length as response.
response	:: numeric()	Predicted response values. Must have the same length as truth.
...	:: any	Additional arguments. Currently ignored.

Value

Performance value as `numeric(1)`.

Meta Information

- Type: "regr"
- Range: $(-\infty, \infty)$
- Minimize: NA
- Required prediction: response

See Also

Other Regression Measures: [ktau](#), [mae](#), [mape](#), [maxae](#), [maxse](#), [medae](#), [medse](#), [mse](#), [msle](#), [pbias](#), [rae](#), [rmse](#), [rmsle](#), [rrse](#), [rse](#), [rsq](#), [sae](#), [smape](#), [srho](#), [sse](#)

Examples

```
set.seed(1)
truth = 1:10
response = truth + rnorm(10)
bias(truth, response)
```

ce *Classification Error*

Description

Classification measure defined as

$$\frac{1}{n} \sum_{i=1}^n (t_i \neq r_i).$$

Usage

```
ce(truth, response, ...)
```

Arguments

truth	:: factor()	True (observed) labels. Must have the same levels and length as response.
response	:: factor()	Predicted response labels. Must have the same levels and length as truth.
...	:: any	Additional arguments. Currently ignored.

Value

Performance value as `numeric(1)`.

Meta Information

- Type: "classif"
- Range: [0, 1]
- Minimize: TRUE
- Required prediction: response

See Also

Other Classification Measures: [acc](#), [bacc](#), [logloss](#)

Examples

```
set.seed(1)
lvls = c("a", "b", "c")
truth = factor(sample(lvls, 10, replace = TRUE), levels = lvls)
response = factor(sample(lvls, 10, replace = TRUE), levels = lvls)
ce(truth, response)
```

confusion_matrix	<i>Calculate Binary Confusion Matrix</i>
------------------	--

Description

Calculates the confusion matrix for a binary classification problem once and then calculates all confusion measures of this package.

Usage

```
confusion_matrix(truth, response, positive, na_value = NaN,  
                 relative = FALSE)
```

Arguments

truth	:: factor() True (observed) labels. Must have the exactly same two levels and the same length as response.
response	:: factor() Predicted response labels. Must have the exactly same two levels and the same length as truth.
positive	:: character(1) Name of the positive class.
na_value	:: numeric(1) Value that should be returned if the measure is not defined for the input (as described in the note). Default is NaN.
relative	:: logical(1) If TRUE, the returned confusion matrix contains relative frequencies instead of absolute frequencies.

Value

List with two elements:

- matrix stores the calculated confusion matrix.
- measures stores the metrics as named numeric vector.

Examples

```
set.seed(123)  
lvl1 = c("a", "b")  
truth = factor(sample(lvl1, 20, replace = TRUE), levels = lvl1)  
response = factor(sample(lvl1, 20, replace = TRUE), levels = lvl1)  
  
confusion_matrix(truth, response, positive = "a")  
confusion_matrix(truth, response, positive = "a", relative = TRUE)  
confusion_matrix(truth, response, positive = "b")
```

 dor

Diagnostic Odds Ratio

Description

Binary classification measure defined as

$$\frac{TP/FP}{FN/TN}$$

Usage

```
dor(truth, response, positive, na_value = NaN, ...)
```

Arguments

truth	:: factor()	True (observed) labels. Must have the exactly same two levels and the same length as response.
response	:: factor()	Predicted response labels. Must have the exactly same two levels and the same length as truth.
positive	:: character(1)	Name of the positive class.
na_value	:: numeric(1)	Value that should be returned if the measure is not defined for the input (as described in the note). Default is NaN.
...	:: any	Additional arguments. Currently ignored.

Value

Performance value as numeric(1).

Meta Information

- Type: "binary"
- Range: $[0, \infty)$
- Minimize: FALSE
- Required prediction: response

Note

This measure is undefined if $FP = 0$ or $FN = 0$.

References

https://en.wikipedia.org/wiki/Template:DiagnosticTesting_Diagram

See Also

Other Binary Classification Measures: [auc](#), [fbeta](#), [fdr](#), [fnr](#), [fn](#), [fomr](#), [fpr](#), [fp](#), [mcc](#), [npv](#), [ppv](#), [tnr](#), [tn](#), [tpr](#), [tp](#)

Examples

```
set.seed(1)
lvls = c("a", "b")
truth = factor(sample(lvls, 10, replace = TRUE), levels = lvls)
response = factor(sample(lvls, 10, replace = TRUE), levels = lvls)
dor(truth, response, positive = "a")
```

fbeta

F-beta Score

Description

Binary classification measure defined with P as [precision\(\)](#) and R as [recall\(\)](#) as

$$(1 + \beta^2) \frac{P \cdot R}{(\beta^2 P) + R}.$$

It measures the effectiveness of retrieval with respect to a user who attaches β times as much importance to recall as precision. For $\beta = 1$, this measure is called "F1" score.

Usage

```
fbeta(truth, response, positive, beta = 1, na_value = NaN, ...)
```

Arguments

truth	:: factor() True (observed) labels. Must have the exactly same two levels and the same length as response.
response	:: factor() Predicted response labels. Must have the exactly same two levels and the same length as truth.
positive	:: character(1) Name of the positive class.
beta	:: numeric(1) Parameter to give either precision or recall more weight. Default is 1, resulting in balanced weights.

```
na_value      :: numeric(1)
               Value that should be returned if the measure is not defined for the input (as
               described in the note). Default is NaN.

...           :: any
               Additional arguments. Currently ignored.
```

Value

Performance value as `numeric(1)`.

Meta Information

- Type: "binary"
- Range: [0, 1]
- Minimize: FALSE
- Required prediction: response

Note

This measure is undefined if either [precision](#) or [recall](#) is undefined, i.e. $TP + FP = 0$ or $TP + FN = 0$.

References

Sasaki Y, others (2007). "The truth of the F-measure." *Teach Tutor mater*, 1(5), 1–5. <https://www.cs.odu.edu/~mukka/cs795sum10dm/Lecturenotes/Day3/F-measure-YS-260ct07.pdf>.

Rijsbergen CJV (1979). *Information Retrieval*, 2nd edition. Butterworth-Heinemann, Newton, MA, USA. ISBN 408709294.

See Also

Other Binary Classification Measures: [auc](#), [dor](#), [fdr](#), [fnr](#), [fn](#), [fomr](#), [fpr](#), [fp](#), [mcc](#), [npv](#), [ppv](#), [tnr](#), [tn](#), [tpr](#), [tp](#)

Examples

```
set.seed(1)
lvls = c("a", "b")
truth = factor(sample(lvls, 10, replace = TRUE), levels = lvls)
response = factor(sample(lvls, 10, replace = TRUE), levels = lvls)
fbeta(truth, response, positive = "a")
```

fdr *False Discovery Rate*

Description

Binary classification measure defined as

$$\frac{FP}{TP + FP}$$

Usage

```
fdr(truth, response, positive, na_value = NaN, ...)
```

Arguments

truth	:: factor() True (observed) labels. Must have the exactly same two levels and the same length as response.
response	:: factor() Predicted response labels. Must have the exactly same two levels and the same length as truth.
positive	:: character(1) Name of the positive class.
na_value	:: numeric(1) Value that should be returned if the measure is not defined for the input (as described in the note). Default is NaN.
...	:: any Additional arguments. Currently ignored.

Value

Performance value as numeric(1).

Meta Information

- Type: "binary"
- Range: [0, 1]
- Minimize: TRUE
- Required prediction: response

Note

This measure is undefined if $TP + FP = 0$.

References

https://en.wikipedia.org/wiki/Template:DiagnosticTesting_Diagram

See Also

Other Binary Classification Measures: [auc](#), [dor](#), [fbeta](#), [fnr](#), [fn](#), [fomr](#), [fpr](#), [fp](#), [mcc](#), [npv](#), [ppv](#), [tnr](#), [tn](#), [tpr](#), [tp](#)

Examples

```
set.seed(1)
lvls = c("a", "b")
truth = factor(sample(lvls, 10, replace = TRUE), levels = lvls)
response = factor(sample(lvls, 10, replace = TRUE), levels = lvls)
fdr(truth, response, positive = "a")
```

fn

False Negatives

Description

Classification measure counting the false negatives (type 2 error), i.e. the number of predictions indicating a negative class label while in fact it is positive. This is sometimes also called a "false alarm".

Usage

```
fn(truth, response, positive, ...)
```

Arguments

truth	:: factor() True (observed) labels. Must have the exactly same two levels and the same length as response.
response	:: factor() Predicted response labels. Must have the exactly same two levels and the same length as truth.
positive	:: character(1) Name of the positive class.
...	:: any Additional arguments. Currently ignored.

Value

Performance value as `numeric(1)`.

Meta Information

- Type: "binary"
- Range: $[0, \infty)$
- Minimize: TRUE
- Required prediction: response

References

https://en.wikipedia.org/wiki/Template:DiagnosticTesting_Diagram

See Also

Other Binary Classification Measures: [auc](#), [dor](#), [fbeta](#), [fdr](#), [fnr](#), [fomr](#), [fpr](#), [fp](#), [mcc](#), [npv](#), [ppv](#), [tnr](#), [tn](#), [tpr](#), [tp](#)

Examples

```
set.seed(1)
lvls = c("a", "b")
truth = factor(sample(lvls, 10, replace = TRUE), levels = lvls)
response = factor(sample(lvls, 10, replace = TRUE), levels = lvls)
fn(truth, response, positive = "a")
```

 fnr

False Negative Rate

Description

Binary classification measure defined as

$$\frac{FN}{TP + FN}$$

Also know as "miss rate".

Usage

```
fnr(truth, response, positive, na_value = NaN, ...)
```

Arguments

truth	:: factor() True (observed) labels. Must have the exactly same two levels and the same length as response.
response	:: factor() Predicted response labels. Must have the exactly same two levels and the same length as truth.

```
positive      :: character(1)
               Name of the positive class.

na_value      :: numeric(1)
               Value that should be returned if the measure is not defined for the input (as
               described in the note). Default is NaN.

...           :: any
               Additional arguments. Currently ignored.
```

Value

Performance value as `numeric(1)`.

Meta Information

- Type: "binary"
- Range: [0, 1]
- Minimize: TRUE
- Required prediction: response

Note

This measure is undefined if $TP + FN = 0$.

References

https://en.wikipedia.org/wiki/Template:DiagnosticTesting_Diagram

See Also

Other Binary Classification Measures: [auc](#), [dor](#), [fbeta](#), [fdr](#), [fn](#), [fomr](#), [fpr](#), [fp](#), [mcc](#), [npv](#), [ppv](#), [tnr](#), [tn](#), [tpr](#), [tp](#)

Examples

```
set.seed(1)
lvls = c("a", "b")
truth = factor(sample(lvls, 10, replace = TRUE), levels = lvls)
response = factor(sample(lvls, 10, replace = TRUE), levels = lvls)
fnr(truth, response, positive = "a")
```

fomr	<i>False Omission Rate</i>
------	----------------------------

Description

Binary classification measure defined as

$$\frac{FN}{FN + TN}$$

Usage

```
fomr(truth, response, positive, na_value = NaN, ...)
```

Arguments

truth	:: factor() True (observed) labels. Must have the exactly same two levels and the same length as response.
response	:: factor() Predicted response labels. Must have the exactly same two levels and the same length as truth.
positive	:: character(1) Name of the positive class.
na_value	:: numeric(1) Value that should be returned if the measure is not defined for the input (as described in the note). Default is NaN.
...	:: any Additional arguments. Currently ignored.

Value

Performance value as numeric(1).

Meta Information

- Type: "binary"
- Range: [0, 1]
- Minimize: TRUE
- Required prediction: response

Note

This measure is undefined if $FN + TN = 0$.

References

https://en.wikipedia.org/wiki/Template:DiagnosticTesting_Diagram

See Also

Other Binary Classification Measures: [auc](#), [dor](#), [fbeta](#), [fdr](#), [fnr](#), [fn](#), [fpr](#), [fp](#), [mcc](#), [npv](#), [ppv](#), [tnr](#), [tn](#), [tpr](#), [tp](#)

Examples

```
set.seed(1)
lvls = c("a", "b")
truth = factor(sample(lvls, 10, replace = TRUE), levels = lvls)
response = factor(sample(lvls, 10, replace = TRUE), levels = lvls)
fomr(truth, response, positive = "a")
```

fp

False Positives

Description

Classification measure counting the false positives (type 1 error), i.e. the number of predictions indicating a positive class label while in fact it is negative.

Usage

```
fp(truth, response, positive, ...)
```

Arguments

truth	:: factor() True (observed) labels. Must have the exactly same two levels and the same length as response.
response	:: factor() Predicted response labels. Must have the exactly same two levels and the same length as truth.
positive	:: character(1) Name of the positive class.
...	:: any Additional arguments. Currently ignored.

Value

Performance value as `numeric(1)`.

Meta Information

- Type: "binary"
- Range: $[0, \infty)$
- Minimize: TRUE
- Required prediction: response

References

https://en.wikipedia.org/wiki/Template:DiagnosticTesting_Diagram

See Also

Other Binary Classification Measures: [auc](#), [dor](#), [fbeta](#), [fdr](#), [fnr](#), [fn](#), [fomr](#), [fpr](#), [mcc](#), [npv](#), [ppv](#), [tnr](#), [tn](#), [tpr](#), [tp](#)

Examples

```
set.seed(1)
lvls = c("a", "b")
truth = factor(sample(lvls, 10, replace = TRUE), levels = lvls)
response = factor(sample(lvls, 10, replace = TRUE), levels = lvls)
fp(truth, response, positive = "a")
```

fpr

False Positive Rate

Description

Binary classification measure defined as

$$\frac{FP}{FP + TN}$$

Also know as fall out or probability of false alarm.

Usage

```
fpr(truth, response, positive, na_value = NaN, ...)
```

Arguments

truth	:: factor() True (observed) labels. Must have the exactly same two levels and the same length as response.
response	:: factor() Predicted response labels. Must have the exactly same two levels and the same length as truth.

```
positive      :: character(1)
               Name of the positive class.

na_value      :: numeric(1)
               Value that should be returned if the measure is not defined for the input (as
               described in the note). Default is NaN.

...          :: any
               Additional arguments. Currently ignored.
```

Value

Performance value as `numeric(1)`.

Meta Information

- Type: "binary"
- Range: [0, 1]
- Minimize: TRUE
- Required prediction: response

Note

This measure is undefined if $FP + TN = 0$.

References

https://en.wikipedia.org/wiki/Template:DiagnosticTesting_Diagram

See Also

Other Binary Classification Measures: [auc](#), [dor](#), [fbeta](#), [fdr](#), [fnr](#), [fn](#), [fomr](#), [fp](#), [mcc](#), [npv](#), [ppv](#), [tnr](#), [tn](#), [tpr](#), [tp](#)

Examples

```
set.seed(1)
lvls = c("a", "b")
truth = factor(sample(lvls, 10, replace = TRUE), levels = lvls)
response = factor(sample(lvls, 10, replace = TRUE), levels = lvls)
fpr(truth, response, positive = "a")
```

ktau	<i>Kendall's tau</i>
------	----------------------

Description

Regression measure defined as Kendall's rank correlation coefficient between truth and response. Calls `stats::cor()` with method set to "kendall".

Usage

```
ktau(truth, response, ...)
```

Arguments

truth	:: numeric() True (observed) values. Must have the same length as response.
response	:: numeric() Predicted response values. Must have the same length as truth.
...	:: any Additional arguments. Currently ignored.

Value

Performance value as `numeric(1)`.

Meta Information

- Type: "regr"
- Range: $[-1, 1]$
- Minimize: FALSE
- Required prediction: response

References

Rosset S, Perlich C, Zadrozny B (2006). "Ranking-based evaluation of regression models." *Knowledge and Information Systems*, **12**(3), 331–353. doi: [10.1007/s1011500600373](https://doi.org/10.1007/s1011500600373).

See Also

Other Regression Measures: [bias](#), [mae](#), [mape](#), [maxae](#), [maxse](#), [medae](#), [medse](#), [mse](#), [msle](#), [pbias](#), [rae](#), [rmse](#), [rmsle](#), [rrse](#), [rse](#), [rsq](#), [sae](#), [smape](#), [srho](#), [sse](#)

Examples

```
set.seed(1)
truth = 1:10
response = truth + rnorm(10)
ktau(truth, response)
```

logloss	<i>Log Loss</i>
---------	-----------------

Description

Classification measure defined as

$$-\frac{1}{n} \sum_{i=1}^n \log(p_i)$$

where p_i is the probability for the true class of observation i .

Usage

```
logloss(truth, prob, eps = 1e-15, ...)
```

Arguments

truth	:: factor()	True (observed) labels. Must have the same levels and length as response.
prob	:: matrix()	Matrix of predicted probabilities, each column is a vector of probabilities for a specific class label. Columns must be named with levels of truth.
eps	:: numeric(1)	Probabilities are clipped to $\max(\text{eps}, \min(1 - \text{eps}, p))$. Otherwise the measure would be undefined for probabilities $p = 0$ and $p = 1$.
...	:: any	Additional arguments. Currently ignored.

Value

Performance value as `numeric(1)`.

Meta Information

- Type: "classif"
- Range: $[0, \infty)$
- Minimize: TRUE
- Required prediction: prob

See Also

Other Classification Measures: [acc](#), [bacc](#), [ce](#)

Examples

```

set.seed(1)
lvls = c("a", "b", "c")
truth = factor(sample(lvls, 10, replace = TRUE), levels = lvls)
prob = matrix(runif(3 * 10), ncol = 3, dimnames = list(NULL, lvls))
prob = t(apply(prob, 1, function(x) x / sum(x)))
logloss(truth, prob)

```

mae

*Mean Absolute Errors***Description**

Regression measure defined as

$$\frac{1}{n} \sum_{i=1}^n |t_i - r_i|.$$

Usage

```
mae(truth, response, ...)
```

Arguments

truth	:: numeric()	True (observed) values. Must have the same length as response.
response	:: numeric()	Predicted response values. Must have the same length as truth.
...	:: any	Additional arguments. Currently ignored.

Value

Performance value as `numeric(1)`.

Meta Information

- Type: "regr"
- Range: $[0, \infty)$
- Minimize: TRUE
- Required prediction: response

See Also

Other Regression Measures: [bias](#), [ktau](#), [mape](#), [maxae](#), [maxse](#), [medae](#), [medse](#), [mse](#), [msle](#), [pbias](#), [rae](#), [rmse](#), [rmsle](#), [rrse](#), [rse](#), [rsq](#), [sae](#), [smape](#), [srho](#), [sse](#)

Examples

```
set.seed(1)
truth = 1:10
response = truth + rnorm(10)
mae(truth, response)
```

mape

*Mean Absolute Percent Error***Description**

Regression measure defined as

$$\frac{1}{n} \sum_{i=1}^n \left| \frac{t_i - r_i}{t_i} \right|.$$

Usage

```
mape(truth, response, na_value = NaN, ...)
```

Arguments

truth	:: numeric()	True (observed) values. Must have the same length as response.
response	:: numeric()	Predicted response values. Must have the same length as truth.
na_value	:: numeric(1)	Value that should be returned if the measure is not defined for the input (as described in the note). Default is NaN.
...	:: any	Additional arguments. Currently ignored.

Value

Performance value as numeric(1).

Meta Information

- Type: "regr"
- Range: $[0, \infty)$
- Minimize: TRUE
- Required prediction: response

Note

This measure is undefined if any element of t is 0.

References

de Myttenaere A, Golden B, Le Grand B, Rossi F (2016). “Mean Absolute Percentage Error for regression models.” *Neurocomputing*, **192**, 38–48. ISSN 0925-2312, doi: [10.1016/j.neucom.2015.12.114](https://doi.org/10.1016/j.neucom.2015.12.114).

See Also

Other Regression Measures: [bias](#), [ktau](#), [mae](#), [maxae](#), [maxse](#), [medae](#), [medse](#), [mse](#), [msle](#), [pbias](#), [rae](#), [rmse](#), [rmsle](#), [rrse](#), [rse](#), [rsq](#), [sae](#), [smape](#), [srho](#), [sse](#)

Examples

```
set.seed(1)
truth = 1:10
response = truth + rnorm(10)
mape(truth, response)
```

maxae

Max Absolute Error

Description

Regression measure defined as

$$\max(|t_i - r_i|).$$

Usage

```
maxae(truth, response, ...)
```

Arguments

truth	:: numeric()	True (observed) values. Must have the same length as response.
response	:: numeric()	Predicted response values. Must have the same length as truth.
...	:: any	Additional arguments. Currently ignored.

Value

Performance value as `numeric(1)`.

Meta Information

- Type: "regr"
- Range: $[0, \infty)$
- Minimize: TRUE
- Required prediction: response

See Also

Other Regression Measures: [bias](#), [ktau](#), [mae](#), [mape](#), [maxse](#), [medae](#), [medse](#), [mse](#), [msle](#), [pbias](#), [rae](#), [rmse](#), [rmsle](#), [rrse](#), [rse](#), [rsq](#), [sae](#), [smape](#), [srho](#), [sse](#)

Examples

```
set.seed(1)
truth = 1:10
response = truth + rnorm(10)
maxae(truth, response)
```

maxse

Max Squared Error

Description

Regression measure defined as

$$\max (t_i - r_i)^2 .$$

Usage

```
maxse(truth, response, ...)
```

Arguments

truth	:: numeric()	True (observed) values. Must have the same length as response.
response	:: numeric()	Predicted response values. Must have the same length as truth.
...	:: any	Additional arguments. Currently ignored.

Value

Performance value as `numeric(1)`.

Meta Information

- Type: "regr"
- Range: $[0, \infty)$
- Minimize: TRUE
- Required prediction: response

See Also

Other Regression Measures: [bias](#), [ktau](#), [mae](#), [mape](#), [maxae](#), [medae](#), [medse](#), [mse](#), [msle](#), [pbias](#), [rae](#), [rmse](#), [rmsle](#), [rrse](#), [rse](#), [rsq](#), [sae](#), [smape](#), [srho](#), [sse](#)

Examples

```
set.seed(1)
truth = 1:10
response = truth + rnorm(10)
maxse(truth, response)
```

mcc

*Matthews Correlation Coefficient***Description**

Binary classification measure defined as

$$\frac{TP \cdot TN - FP \cdot FN}{\sqrt{(TP + FP)(TP + FN)(TN + FP)(TN + FN)}}$$

Usage

```
mcc(truth, response, positive, ...)
```

Arguments

truth	:: factor() True (observed) labels. Must have the exactly same two levels and the same length as response.
response	:: factor() Predicted response labels. Must have the exactly same two levels and the same length as truth.
positive	:: character(1) Name of the positive class.
...	:: any Additional arguments. Currently ignored.

Value

Performance value as numeric(1).

Meta Information

- Type: "binary"
- Range: [-1, 1]
- Minimize: FALSE
- Required prediction: response

Note

This measure is undefined if any of the four sums in the denominator is 0. The denominator is then set to 1.

References

Matthews BW (1975). "Comparison of the predicted and observed secondary structure of T4 phage lysozyme." *Biochimica et Biophysica Acta (BBA) - Protein Structure*, **405**(2), 442–451. doi: [10.1016/00052795\(75\)901099](https://doi.org/10.1016/00052795(75)901099).

See Also

Other Binary Classification Measures: [auc](#), [dor](#), [fbeta](#), [fdr](#), [fnr](#), [fn](#), [fomr](#), [fpr](#), [fp](#), [npv](#), [ppv](#), [tnr](#), [tn](#), [tpr](#), [tp](#)

Examples

```
set.seed(1)
lvls = c("a", "b")
truth = factor(sample(lvls, 10, replace = TRUE), levels = lvls)
response = factor(sample(lvls, 10, replace = TRUE), levels = lvls)
mcc(truth, response, positive = "a")
```

measures

Measure Registry

Description

The `environment()` measures keeps track of all measures in this package. Stores meta information about measures, such as minimum, maximum of if the measure must be minimized or maximized.

Usage

```
measures
```

Format

An object of class environment of length 45.

Examples

```
names(measures)
measures$tpr
```

medae *Median Absolute Errors*

Description

Regression measure defined as

$$\operatorname{median}_i |t_i - r_i|.$$

Usage

```
medae(truth, response, ...)
```

Arguments

truth	:: numeric()	True (observed) values. Must have the same length as response.
response	:: numeric()	Predicted response values. Must have the same length as truth.
...	:: any	Additional arguments. Currently ignored.

Value

Performance value as `numeric(1)`.

Meta Information

- Type: "regr"
- Range: $[0, \infty)$
- Minimize: TRUE
- Required prediction: response

See Also

Other Regression Measures: [bias](#), [ktau](#), [mae](#), [mape](#), [maxae](#), [maxse](#), [medse](#), [mse](#), [msle](#), [pbias](#), [rae](#), [rmse](#), [rmsle](#), [rrse](#), [rse](#), [rsq](#), [sae](#), [smape](#), [srho](#), [sse](#)

Examples

```
set.seed(1)
truth = 1:10
response = truth + rnorm(10)
medae(truth, response)
```

`medse`*Median Squared Error*

Description

Regression measure defined as

$$\operatorname{median}_i \left[(t_i - r_i)^2 \right].$$

Usage`medse(truth, response, ...)`**Arguments**

<code>truth</code>	:: <code>numeric()</code> True (observed) values. Must have the same length as <code>response</code> .
<code>response</code>	:: <code>numeric()</code> Predicted response values. Must have the same length as <code>truth</code> .
<code>...</code>	:: <code>any</code> Additional arguments. Currently ignored.

ValuePerformance value as `numeric(1)`.**Meta Information**

- Type: "regr"
- Range: $[0, \infty)$
- Minimize: TRUE
- Required prediction: response

See AlsoOther Regression Measures: [bias](#), [ktau](#), [mae](#), [mape](#), [maxae](#), [maxse](#), [medae](#), [mse](#), [msle](#), [pbias](#), [rae](#), [rmse](#), [rmsle](#), [rrse](#), [rse](#), [rsq](#), [sae](#), [smape](#), [srho](#), [sse](#)**Examples**

```
set.seed(1)
truth = 1:10
response = truth + rnorm(10)
medse(truth, response)
```

mse	<i>Mean Squared Error</i>
-----	---------------------------

Description

Regression measure defined as

$$\frac{1}{n} \sum_{i=1}^n (t_i - r_i)^2 .$$

Usage

```
mse(truth, response, ...)
```

Arguments

truth	:: numeric()	True (observed) values. Must have the same length as response.
response	:: numeric()	Predicted response values. Must have the same length as truth.
...	:: any	Additional arguments. Currently ignored.

Value

Performance value as `numeric(1)`.

Meta Information

- Type: "regr"
- Range: $[0, \infty)$
- Minimize: TRUE
- Required prediction: response

See Also

Other Regression Measures: [bias](#), [ktau](#), [mae](#), [mape](#), [maxae](#), [maxse](#), [medae](#), [medse](#), [msle](#), [pbias](#), [rae](#), [rmse](#), [rmsle](#), [rrse](#), [rse](#), [rsq](#), [sae](#), [smape](#), [srho](#), [sse](#)

Examples

```
set.seed(1)
truth = 1:10
response = truth + rnorm(10)
mse(truth, response)
```

msle

*Mean Squared Log Error***Description**

Regression measure defined as

$$\frac{1}{n} \sum_{i=1}^n (\ln(1 + t_i) - \ln(1 + r_i))^2.$$

Usage

```
msle(truth, response, na_value = NaN, ...)
```

Arguments

truth	:: numeric()	True (observed) values. Must have the same length as response.
response	:: numeric()	Predicted response values. Must have the same length as truth.
na_value	:: numeric(1)	Value that should be returned if the measure is not defined for the input (as described in the note). Default is NaN.
...	:: any	Additional arguments. Currently ignored.

Value

Performance value as numeric(1).

Meta Information

- Type: "regr"
- Range: $[0, \infty)$
- Minimize: TRUE
- Required prediction: response

Note

This measure is undefined if any element of t or r is less than or equal to -1 .

See Also

Other Regression Measures: [bias](#), [ktau](#), [mae](#), [mape](#), [maxae](#), [maxse](#), [medae](#), [medse](#), [mse](#), [pbias](#), [rae](#), [rmse](#), [rmsle](#), [rrse](#), [rse](#), [rsq](#), [sae](#), [smape](#), [srho](#), [sse](#)

Examples

```
set.seed(1)
truth = 1:10
response = truth + rnorm(10)
msle(truth, response)
```

 npv

Negative Predictive Value

Description

Binary classification measure defined as

$$\frac{TN}{FN + TN}$$

Usage

```
npv(truth, response, positive, na_value = NaN, ...)
```

Arguments

truth	:: factor() True (observed) labels. Must have the exactly same two levels and the same length as response.
response	:: factor() Predicted response labels. Must have the exactly same two levels and the same length as truth.
positive	:: character(1) Name of the positive class.
na_value	:: numeric(1) Value that should be returned if the measure is not defined for the input (as described in the note). Default is NaN.
...	:: any Additional arguments. Currently ignored.

Value

Performance value as `numeric(1)`.

Meta Information

- Type: "binary"
- Range: [0, 1]
- Minimize: FALSE
- Required prediction: response

Note

This measure is undefined if $FN + TN = 0$.

References

https://en.wikipedia.org/wiki/Template:DiagnosticTesting_Diagram

See Also

Other Binary Classification Measures: [auc](#), [dor](#), [fbeta](#), [fdr](#), [fnr](#), [fn](#), [fomr](#), [fpr](#), [fp](#), [mcc](#), [ppv](#), [tnr](#), [tn](#), [tpr](#), [tp](#)

Examples

```
set.seed(1)
lvls = c("a", "b")
truth = factor(sample(lvls, 10, replace = TRUE), levels = lvls)
response = factor(sample(lvls, 10, replace = TRUE), levels = lvls)
npv(truth, response, positive = "a")
```

pbias

Percent Bias

Description

Regression measure defined as

$$\frac{1}{n} \sum_{i=1}^n \frac{(t_i - r_i)}{|t_i|}.$$

Good predictions score close to 0.

Usage

```
pbias(truth, response, na_value = NaN, ...)
```

Arguments

truth	:: numeric() True (observed) values. Must have the same length as response.
response	:: numeric() Predicted response values. Must have the same length as truth.
na_value	:: numeric(1) Value that should be returned if the measure is not defined for the input (as described in the note). Default is NaN.
...	:: any Additional arguments. Currently ignored.

Value

Performance value as `numeric(1)`.

Meta Information

- Type: "regr"
- Range: $(-\infty, \infty)$
- Minimize: NA
- Required prediction: response

See Also

Other Regression Measures: [bias](#), [ktau](#), [mae](#), [mape](#), [maxae](#), [maxse](#), [medae](#), [medse](#), [mse](#), [msle](#), [rae](#), [rmse](#), [rmsle](#), [rrse](#), [rse](#), [rsq](#), [sae](#), [smape](#), [srho](#), [sse](#)

Examples

```
set.seed(1)
truth = 1:10
response = truth + rnorm(10)
pbias(truth, response)
```

 ppv

Positive Predictive Value

Description

Binary classification measure defined as

$$\frac{TP}{TP + FP}$$

Also know as "precision".

Usage

```
ppv(truth, response, positive, na_value = NaN, ...)
```

```
precision(truth, response, positive, na_value = NaN, ...)
```

Arguments

truth	:: factor() True (observed) labels. Must have the exactly same two levels and the same length as response.
response	:: factor() Predicted response labels. Must have the exactly same two levels and the same length as truth.

```
positive      :: character(1)
               Name of the positive class.

na_value      :: numeric(1)
               Value that should be returned if the measure is not defined for the input (as
               described in the note). Default is NaN.

...           :: any
               Additional arguments. Currently ignored.
```

Value

Performance value as `numeric(1)`.

Meta Information

- Type: "binary"
- Range: [0, 1]
- Minimize: FALSE
- Required prediction: response

Note

This measure is undefined if $TP + FP = 0$.

References

https://en.wikipedia.org/wiki/Template:DiagnosticTesting_Diagram

See Also

Other Binary Classification Measures: [auc](#), [dor](#), [fbeta](#), [fdr](#), [fnr](#), [fn](#), [fomr](#), [fpr](#), [fp](#), [mcc](#), [npv](#), [tnr](#), [tn](#), [tpr](#), [tp](#)

Examples

```
set.seed(1)
lvls = c("a", "b")
truth = factor(sample(lvls, 10, replace = TRUE), levels = lvls)
response = factor(sample(lvls, 10, replace = TRUE), levels = lvls)
ppv(truth, response, positive = "a")
```

rae	<i>Relative Absolute Error</i>
-----	--------------------------------

Description

Regression measure defined as

$$\frac{\sum_{i=1}^n |t_i - r_i|}{\sum_{i=1}^n |t_i - \bar{t}|}$$

Can be interpreted as absolute error of the predictions relative to a naive model predicting the mean.

Usage

```
rae(truth, response, na_value = NaN, ...)
```

Arguments

truth	:: numeric()	True (observed) values. Must have the same length as response.
response	:: numeric()	Predicted response values. Must have the same length as truth.
na_value	:: numeric(1)	Value that should be returned if the measure is not defined for the input (as described in the note). Default is NaN.
...	:: any	Additional arguments. Currently ignored.

Value

Performance value as numeric(1).

Meta Information

- Type: "regr"
- Range: $[0, \infty)$
- Minimize: TRUE
- Required prediction: response

Note

This measure is undefined for constant t .

See Also

Other Regression Measures: [bias](#), [ktau](#), [mae](#), [mape](#), [maxae](#), [maxse](#), [medae](#), [medse](#), [mse](#), [msle](#), [pbias](#), [rmse](#), [rmsle](#), [rrse](#), [rse](#), [rsq](#), [sae](#), [smape](#), [srho](#), [sse](#)

Examples

```
set.seed(1)
truth = 1:10
response = truth + rnorm(10)
rae(truth, response)
```

rmse

*Root Mean Squared Error***Description**

Regression measure defined as

$$\sqrt{\frac{1}{n} \sum_{i=1}^n (t_i - r_i)^2}.$$

Usage

```
rmse(truth, response, ...)
```

Arguments

truth	:: numeric() True (observed) values. Must have the same length as response.
response	:: numeric() Predicted response values. Must have the same length as truth.
...	:: any Additional arguments. Currently ignored.

Value

Performance value as numeric(1).

Meta Information

- Type: "regr"
- Range: $[0, \infty)$
- Minimize: TRUE
- Required prediction: response

See Also

Other Regression Measures: [bias](#), [ktau](#), [mae](#), [mape](#), [maxae](#), [maxse](#), [medae](#), [medse](#), [mse](#), [msle](#), [pbias](#), [rae](#), [rmsle](#), [rrse](#), [rse](#), [rsq](#), [sae](#), [smape](#), [srho](#), [sse](#)

Examples

```
set.seed(1)
truth = 1:10
response = truth + rnorm(10)
rmse(truth, response)
```

rmsle *Root Mean Squared Log Error*

Description

Regression measure defined as

$$\sqrt{\frac{1}{n} \sum_{i=1}^n (\ln(1 + t_i) - \ln(1 + r_i))^2}.$$

Usage

```
rmsle(truth, response, na_value = NaN, ...)
```

Arguments

truth	:: numeric() True (observed) values. Must have the same length as response.
response	:: numeric() Predicted response values. Must have the same length as truth.
na_value	:: numeric(1) Value that should be returned if the measure is not defined for the input (as described in the note). Default is NaN.
...	:: any Additional arguments. Currently ignored.

Value

Performance value as numeric(1).

Meta Information

- Type: "regr"
- Range: $[0, \infty)$
- Minimize: TRUE
- Required prediction: response

Note

This measure is undefined if any element of t or r is less than or equal to -1 .

See Also

Other Regression Measures: [bias](#), [ktau](#), [mae](#), [mape](#), [maxae](#), [maxse](#), [medae](#), [medse](#), [mse](#), [msle](#), [pbias](#), [rae](#), [rmse](#), [rrse](#), [rse](#), [rsq](#), [sae](#), [smape](#), [srho](#), [sse](#)

Examples

```
set.seed(1)
truth = 1:10
response = truth + rnorm(10)
rmsle(truth, response)
```

 rrse

Root Relative Squared Error

Description

Regression measure defined as

$$\sqrt{\frac{\sum_{i=1}^n (t_i - r_i)^2}{\sum_{i=1}^n (t_i - \bar{t})^2}}$$

Can be interpreted as root of the squared error of the predictions relative to a naive model predicting the mean.

Usage

```
rrse(truth, response, na_value = NaN, ...)
```

Arguments

truth	:: numeric() True (observed) values. Must have the same length as response.
response	:: numeric() Predicted response values. Must have the same length as truth.
na_value	:: numeric(1) Value that should be returned if the measure is not defined for the input (as described in the note). Default is NaN.
...	:: any Additional arguments. Currently ignored.

Value

Performance value as numeric(1).

Meta Information

- Type: "regr"
- Range: $[0, \infty)$
- Minimize: TRUE
- Required prediction: response

Note

This measure is undefined for constant t .

See Also

Other Regression Measures: [bias](#), [ktau](#), [mae](#), [mape](#), [maxae](#), [maxse](#), [medae](#), [medse](#), [mse](#), [msle](#), [pbias](#), [rae](#), [rmse](#), [rmsle](#), [rse](#), [rsq](#), [sae](#), [smape](#), [srho](#), [sse](#)

Examples

```
set.seed(1)
truth = 1:10
response = truth + rnorm(10)
rrse(truth, response)
```

rse

*Relative Squared Error***Description**

Regression measure defined as

$$\frac{\sum_{i=1}^n (t_i - r_i)^2}{\sum_{i=1}^n (t_i - \bar{t})^2}$$

Can be interpreted as squared error of the predictions relative to a naive model predicting the mean.

Usage

```
rse(truth, response, na_value = NaN, ...)
```

Arguments

truth	:: numeric() True (observed) values. Must have the same length as response.
response	:: numeric() Predicted response values. Must have the same length as truth.
na_value	:: numeric(1) Value that should be returned if the measure is not defined for the input (as described in the note). Default is NaN.
...	:: any Additional arguments. Currently ignored.

Value

Performance value as `numeric(1)`.

Meta Information

- Type: "regr"
- Range: $[0, \infty)$
- Minimize: TRUE
- Required prediction: response

Note

This measure is undefined for constant t .

See Also

Other Regression Measures: [bias](#), [ktau](#), [mae](#), [mape](#), [maxae](#), [maxse](#), [medae](#), [medse](#), [mse](#), [msle](#), [pbias](#), [rae](#), [rmse](#), [rmsle](#), [rrse](#), [rsq](#), [sae](#), [smape](#), [srho](#), [sse](#)

Examples

```
set.seed(1)
truth = 1:10
response = truth + rnorm(10)
rse(truth, response)
```

rsq

R Squared

Description

Regression measure defined as

$$1 - \frac{\sum_{i=1}^n (t_i - r_i)^2}{\sum_{i=1}^n (t_i - \bar{t})^2}.$$

Also known as coefficient of determination or explained variation. Subtracts the `rse()` from 1, hence it compares the squared error of the predictions relative to a naive model predicting the mean.

Usage

```
rsq(truth, response, na_value = NaN, ...)
```

Arguments

<code>truth</code>	:: numeric() True (observed) values. Must have the same length as <code>response</code> .
<code>response</code>	:: numeric() Predicted response values. Must have the same length as <code>truth</code> .
<code>na_value</code>	:: numeric(1) Value that should be returned if the measure is not defined for the input (as described in the note). Default is <code>NaN</code> .
<code>...</code>	:: any Additional arguments. Currently ignored.

Value

Performance value as `numeric(1)`.

Meta Information

- Type: "regr"
- Range: $(-\infty, 1]$
- Minimize: FALSE
- Required prediction: response

Note

This measure is undefined for constant t .

See Also

Other Regression Measures: [bias](#), [ktau](#), [mae](#), [mape](#), [maxae](#), [maxse](#), [medae](#), [medse](#), [mse](#), [msle](#), [pbias](#), [rae](#), [rmse](#), [rmsle](#), [rrse](#), [rse](#), [sae](#), [smape](#), [srho](#), [sse](#)

Examples

```
set.seed(1)
truth = 1:10
response = truth + rnorm(10)
rsq(truth, response)
```

sae *Sum of Absolute Errors*

Description

Regression measure defined as

$$\sum_{i=1}^n |t_i - r_i|.$$

Usage

```
sae(truth, response, ...)
```

Arguments

truth	:: numeric()	True (observed) values. Must have the same length as response.
response	:: numeric()	Predicted response values. Must have the same length as truth.
...	:: any	Additional arguments. Currently ignored.

Value

Performance value as `numeric(1)`.

Meta Information

- Type: "regr"
- Range: $[0, \infty)$
- Minimize: TRUE
- Required prediction: response

See Also

Other Regression Measures: [bias](#), [ktau](#), [mae](#), [mape](#), [maxae](#), [maxse](#), [medae](#), [medse](#), [mse](#), [msle](#), [pbias](#), [rae](#), [rmse](#), [rmsle](#), [rrse](#), [rse](#), [rsq](#), [smape](#), [srho](#), [sse](#)

Examples

```
set.seed(1)
truth = 1:10
response = truth + rnorm(10)
sae(truth, response)
```

smape

Symmetric Mean Absolute Percent Error

Description

Regression measure defined as

$$\frac{2}{n} \sum_{i=1}^n \frac{|t_i - r_i|}{|t_i| + |r_i|}$$

Usage

```
smape(truth, response, na_value = NaN, ...)
```

Arguments

truth	:: numeric()	True (observed) values. Must have the same length as response.
response	:: numeric()	Predicted response values. Must have the same length as truth.
na_value	:: numeric(1)	Value that should be returned if the measure is not defined for the input (as described in the note). Default is NaN.
...	:: any	Additional arguments. Currently ignored.

Value

Performance value as `numeric(1)`.

Meta Information

- Type: "regr"
- Range: [0, 2]
- Minimize: TRUE
- Required prediction: response

Note

This measure is undefined if if any $|t| + |r|$ is 0.

See Also

Other Regression Measures: [bias](#), [ktau](#), [mae](#), [mape](#), [maxae](#), [maxse](#), [medae](#), [medse](#), [mse](#), [msle](#), [pbias](#), [rae](#), [rmse](#), [rmsle](#), [rrse](#), [rse](#), [rsq](#), [sae](#), [srho](#), [sse](#)

Examples

```
set.seed(1)
truth = 1:10
response = truth + rnorm(10)
smape(truth, response)
```

srho

*Spearman's rho***Description**

Regression measures defined as Spearman's rank correlation coefficient between truth and response. Calls `stats::cor()` with method set to "spearman".

Usage

```
srho(truth, response, ...)
```

Arguments

truth	:: numeric()	True (observed) values. Must have the same length as response.
response	:: numeric()	Predicted response values. Must have the same length as truth.
...	:: any	Additional arguments. Currently ignored.

Value

Performance value as numeric(1).

Meta Information

- Type: "regr"
- Range: [-1, 1]
- Minimize: FALSE
- Required prediction: response

References

Rosset S, Perlich C, Zadrozny B (2006). "Ranking-based evaluation of regression models." *Knowledge and Information Systems*, **12**(3), 331–353. doi: [10.1007/s1011500600373](https://doi.org/10.1007/s1011500600373).

See Also

Other Regression Measures: [bias](#), [ktau](#), [mae](#), [mape](#), [maxae](#), [maxse](#), [medae](#), [medse](#), [mse](#), [msle](#), [pbias](#), [rae](#), [rmse](#), [rmsle](#), [rrse](#), [rse](#), [rsq](#), [sae](#), [smape](#), [sse](#)

Examples

```
set.seed(1)
truth = 1:10
response = truth + rnorm(10)
srho(truth, response)
```

sse

*Sum of Squared Errors***Description**

Regression measure defined as

$$\sum_{i=1}^n (t_i - r_i)^2.$$

Usage

```
sse(truth, response, ...)
```

Arguments

truth	:: numeric()	True (observed) values. Must have the same length as response.
response	:: numeric()	Predicted response values. Must have the same length as truth.
...	:: any	Additional arguments. Currently ignored.

Value

Performance value as `numeric(1)`.

Meta Information

- Type: "regr"
- Range: $[0, \infty)$
- Minimize: TRUE
- Required prediction: response

See Also

Other Regression Measures: [bias](#), [ktau](#), [mae](#), [mape](#), [maxae](#), [maxse](#), [medae](#), [medse](#), [mse](#), [msle](#), [pbias](#), [rae](#), [rmse](#), [rmsle](#), [rrse](#), [rse](#), [rsq](#), [sae](#), [smape](#), [srho](#)

Examples

```
set.seed(1)
truth = 1:10
response = truth + rnorm(10)
sse(truth, response)
```

tn	<i>True Negatives</i>
----	-----------------------

Description

Classification measure counting the true negatives, i.e. the number of predictions correctly indicating a negative class label.

Usage

```
tn(truth, response, positive, ...)
```

Arguments

truth	:: factor() True (observed) labels. Must have the exactly same two levels and the same length as response.
response	:: factor() Predicted response labels. Must have the exactly same two levels and the same length as truth.
positive	:: character(1) Name of the positive class.
...	:: any Additional arguments. Currently ignored.

Value

Performance value as `numeric(1)`.

Meta Information

- Type: "binary"
- Range: $[0, \infty)$
- Minimize: FALSE
- Required prediction: response

References

https://en.wikipedia.org/wiki/Template:DiagnosticTesting_Diagram

See Also

Other Binary Classification Measures: [auc](#), [dor](#), [fbeta](#), [fdr](#), [fnr](#), [fn](#), [fomr](#), [fpr](#), [fp](#), [mcc](#), [npv](#), [ppv](#), [tnr](#), [tpr](#), [tp](#)

Examples

```
set.seed(1)
lvls = c("a", "b")
truth = factor(sample(lvls, 10, replace = TRUE), levels = lvls)
response = factor(sample(lvls, 10, replace = TRUE), levels = lvls)
tn(truth, response, positive = "a")
```

tnr	<i>True Negative Rate</i>
-----	---------------------------

Description

Binary classification measure defined as

$$\frac{TN}{FP + TN}$$

Also know as "specificity".

Usage

```
tnr(truth, response, positive, na_value = NaN, ...)
```

```
specificity(truth, response, positive, na_value = NaN, ...)
```

Arguments

truth	:: factor() True (observed) labels. Must have the exactly same two levels and the same length as response.
response	:: factor() Predicted response labels. Must have the exactly same two levels and the same length as truth.
positive	:: character(1) Name of the positive class.
na_value	:: numeric(1) Value that should be returned if the measure is not defined for the input (as described in the note). Default is NaN.
...	:: any Additional arguments. Currently ignored.

Value

Performance value as `numeric(1)`.

Meta Information

- Type: "binary"
- Range: [0, 1]
- Minimize: FALSE
- Required prediction: response

Note

This measure is undefined if $FP + TN = 0$.

References

https://en.wikipedia.org/wiki/Template:DiagnosticTesting_Diagram

See Also

Other Binary Classification Measures: [auc](#), [dor](#), [fbeta](#), [fdr](#), [fnr](#), [fn](#), [fomr](#), [fpr](#), [fp](#), [mcc](#), [npv](#), [ppv](#), [tn](#), [tpr](#), [tp](#)

Examples

```
set.seed(1)
lvls = c("a", "b")
truth = factor(sample(lvls, 10, replace = TRUE), levels = lvls)
response = factor(sample(lvls, 10, replace = TRUE), levels = lvls)
tnr(truth, response, positive = "a")
```

tp

True Positives

Description

Binary classification measure counting the true positives, i.e. the number of predictions correctly indicating a positive class label.

Usage

```
tp(truth, response, positive, ...)
```

Arguments

truth	:: factor() True (observed) labels. Must have the exactly same two levels and the same length as response.
response	:: factor() Predicted response labels. Must have the exactly same two levels and the same length as truth.
positive	:: character(1) Name of the positive class.
...	:: any Additional arguments. Currently ignored.

Value

Performance value as numeric(1).

Meta Information

- Type: "binary"
- Range: $[0, \infty)$
- Minimize: FALSE
- Required prediction: response

References

https://en.wikipedia.org/wiki/Template:DiagnosticTesting_Diagram

See Also

Other Binary Classification Measures: [auc](#), [dor](#), [fbeta](#), [fdr](#), [fnr](#), [fn](#), [fomr](#), [fpr](#), [fp](#), [mcc](#), [npv](#), [ppv](#), [tnr](#), [tn](#), [tpr](#)

Examples

```
set.seed(1)
lvls = c("a", "b")
truth = factor(sample(lvls, 10, replace = TRUE), levels = lvls)
response = factor(sample(lvls, 10, replace = TRUE), levels = lvls)
tp(truth, response, positive = "a")
```

tpr *True Positive Rate*

Description

Binary classification measure defined as

$$\frac{TP}{TP + FN}$$

Also know as "recall" or "sensitivity".

Usage

```
tpr(truth, response, positive, na_value = NaN, ...)
```

```
recall(truth, response, positive, na_value = NaN, ...)
```

```
sensitivity(truth, response, positive, na_value = NaN, ...)
```

Arguments

truth	:: factor() True (observed) labels. Must have the exactly same two levels and the same length as response.
response	:: factor() Predicted response labels. Must have the exactly same two levels and the same length as truth.
positive	:: character(1) Name of the positive class.
na_value	:: numeric(1) Value that should be returned if the measure is not defined for the input (as described in the note). Default is NaN.
...	:: any Additional arguments. Currently ignored.

Value

Performance value as `numeric(1)`.

Meta Information

- Type: "binary"
- Range: [0, 1]
- Minimize: FALSE
- Required prediction: response

Note

This measure is undefined if $FP + TN = 0$.

References

https://en.wikipedia.org/wiki/Template:DiagnosticTesting_Diagram

See Also

Other Binary Classification Measures: [auc](#), [dor](#), [fbeta](#), [fdr](#), [fnr](#), [fn](#), [fomr](#), [fpr](#), [fp](#), [mcc](#), [npv](#), [ppv](#), [tnr](#), [tn](#), [tp](#)

Examples

```
set.seed(1)
lvls = c("a", "b")
truth = factor(sample(lvls, 10, replace = TRUE), levels = lvls)
response = factor(sample(lvls, 10, replace = TRUE), levels = lvls)
tpr(truth, response, positive = "a")
```

Index

- *Topic **datasets**
 - measures, 28
- acc, 3, 6, 8, 22
- auc, 4, 11, 12, 14–16, 18–20, 28, 34, 36, 49–51, 53
- bacc, 4, 5, 8, 22
- bias, 7, 21, 23, 25, 26, 29–32, 35, 37, 38, 40–47
- ce, 4, 6, 8, 22
- confusion_matrix, 9
- dor, 5, 10, 12, 14–16, 18–20, 28, 34, 36, 49–51, 53
- environment(), 28
- fbeta, 5, 11, 11, 14–16, 18–20, 28, 34, 36, 49–51, 53
- fdr, 5, 11, 12, 13, 15, 16, 18–20, 28, 34, 36, 49–51, 53
- fn, 5, 11, 12, 14, 14, 16, 18–20, 28, 34, 36, 49–51, 53
- fnr, 5, 11, 12, 14, 15, 15, 18–20, 28, 34, 36, 49–51, 53
- fomr, 5, 11, 12, 14–16, 17, 19, 20, 28, 34, 36, 49–51, 53
- fp, 5, 11, 12, 14–16, 18, 18, 20, 28, 34, 36, 49–51, 53
- fpr, 5, 11, 12, 14–16, 18, 19, 19, 28, 34, 36, 49–51, 53
- ktau, 7, 21, 23, 25, 26, 29–32, 35, 37, 38, 40–47
- logloss, 4, 6, 8, 22
- mae, 7, 21, 23, 25, 26, 29–32, 35, 37, 38, 40–47
- mape, 7, 21, 23, 24, 26, 29–32, 35, 37, 38, 40–47
- maxae, 7, 21, 23, 25, 25, 26, 29–32, 35, 37, 38, 40–47
- maxse, 7, 21, 23, 25, 26, 26, 29–32, 35, 37, 38, 40–47
- mcc, 5, 11, 12, 14–16, 18–20, 27, 34, 36, 49–51, 53
- measures, 28
- medae, 7, 21, 23, 25, 26, 29, 30–32, 35, 37, 38, 40–47
- medse, 7, 21, 23, 25, 26, 29, 30, 31, 32, 35, 37, 38, 40–47
- mlr3measures (mlr3measures-package), 3
- mlr3measures-package, 3
- mse, 7, 21, 23, 25, 26, 29, 30, 31, 32, 35, 37, 38, 40–47
- msle, 7, 21, 23, 25, 26, 29–31, 32, 35, 37, 38, 40–47
- npv, 5, 11, 12, 14–16, 18–20, 28, 33, 36, 49–51, 53
- pbias, 7, 21, 23, 25, 26, 29–32, 34, 37, 38, 40–47
- ppv, 5, 11, 12, 14–16, 18–20, 28, 34, 35, 49–51, 53
- precision, 12
- precision (ppv), 35
- precision(), 11
- rae, 7, 21, 23, 25, 26, 29–32, 35, 37, 38, 40–47
- recall, 12
- recall (tpr), 52
- recall(), 11
- rmse, 7, 21, 23, 25, 26, 29–32, 35, 37, 38, 40–47
- rmsle, 7, 21, 23, 25, 26, 29–32, 35, 37, 38, 39, 41–47
- rrse, 7, 21, 23, 25, 26, 29–32, 35, 37, 38, 40, 40, 42–47

rse, 7, 21, 23, 25, 26, 29–32, 35, 37, 38, 40,
41, 41, 43–47
rse(), 42
rsq, 7, 21, 23, 25, 26, 29–32, 35, 37, 38,
40–42, 42, 44–47

sae, 7, 21, 23, 25, 26, 29–32, 35, 37, 38,
40–43, 44, 45–47
sensitivity (tpr), 52
smape, 7, 21, 23, 25, 26, 29–32, 35, 37, 38,
40–44, 45, 46, 47
specificity (tnr), 49
srho, 7, 21, 23, 25, 26, 29–32, 35, 37, 38,
40–45, 46, 47
sse, 7, 21, 23, 25, 26, 29–32, 35, 37, 38,
40–46, 47
stats::cor(), 21, 46

tn, 5, 11, 12, 14–16, 18–20, 28, 34, 36, 48, 50,
51, 53
tnr, 5, 11, 12, 14–16, 18–20, 28, 34, 36, 49,
49, 51, 53
tp, 5, 11, 12, 14–16, 18–20, 28, 34, 36, 49, 50,
50, 53
tpr, 5, 11, 12, 14–16, 18–20, 28, 34, 36,
49–51, 52