

# Package ‘Metrics’

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**Title** Evaluation Metrics for Machine Learning

**Description** An implementation of evaluation metrics in R that are commonly used in supervised machine learning. It implements metrics for regression, time series, binary classification, classification, and information retrieval problems. It has zero dependencies and a consistent, simple interface for all functions.

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**Suggests** testthat

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---

accuracy

*Accuracy*

---

### Description

accuracy is defined as the proportion of elements in actual that are equal to the corresponding element in predicted

### Usage

accuracy(actual, predicted)

### Arguments

actual	The ground truth vector, where elements of the vector can be any variable type.
predicted	The predicted vector, where elements of the vector represent a prediction for the corresponding value in actual.

**See Also**[ce](#)**Examples**

```
actual <- c('a', 'a', 'c', 'b', 'c')
predicted <- c('a', 'b', 'c', 'b', 'a')
accuracy(actual, predicted)
```

---

ae

*Absolute Error*

---

**Description**

ae computes the elementwise absolute difference between two numeric vectors.

**Usage**

```
ae(actual, predicted)
```

**Arguments**

actual	The ground truth numeric vector.
predicted	The predicted numeric vector, where each element in the vector is a prediction for the corresponding element in actual.

**See Also**[mae](#) [mdae](#) [mape](#)**Examples**

```
actual <- c(1.1, 1.9, 3.0, 4.4, 5.0, 5.6)
predicted <- c(0.9, 1.8, 2.5, 4.5, 5.0, 6.2)
ae(actual, predicted)
```

---

ape

*Absolute Percent Error*

---

### Description

ape computes the elementwise absolute percent difference between two numeric vectors

### Usage

```
ape(actual, predicted)
```

### Arguments

actual	The ground truth numeric vector.
predicted	The predicted numeric vector, where each element in the vector is a prediction for the corresponding element in actual.

### Details

ape is calculated as  $(\text{actual} - \text{predicted}) / \text{abs}(\text{actual})$ . This means that the function will return  $-\text{Inf}$ ,  $\text{Inf}$ , or  $\text{NaN}$  if actual is zero.

### See Also

[mape](#) [smape](#)

### Examples

```
actual <- c(1.1, 1.9, 3.0, 4.4, 5.0, 5.6)
predicted <- c(0.9, 1.8, 2.5, 4.5, 5.0, 6.2)
ape(actual, predicted)
```

---

apk

*Average Precision at k*

---

### Description

apk computes the average precision at k, in the context of information retrieval problems.

### Usage

```
apk(k, actual, predicted)
```

**Arguments**

k	The number of elements of predicted to consider in the calculation.
actual	The ground truth vector of relevant documents. The vector can contain any numeric or character values, order does not matter, and the vector does not need to be the same length as predicted.
predicted	The predicted vector of retrieved documents. The vector can contain any numeric or character values. However, unlike actual, order does matter, with the most documents deemed most likely to be relevant at the beginning.

**Details**

apk loops over the first k values of predicted. For each value, if the value is contained within actual and has not been predicted before, we increment the number of successes by one and increment our score by the number of successes divided by k. Then, we return our final score divided by the number of relevant documents (i.e. the length of actual).

apk will return NaN if length(actual) equals 0.

**See Also**

[apk f1](#)

**Examples**

```
actual <- c('a', 'b', 'd')
predicted <- c('b', 'c', 'a', 'e', 'f')
apk(3, actual, predicted)
```

---

auc

*Area under the ROC curve (AUC)*

---

**Description**

auc computes the area under the receiver-operator characteristic curve (AUC).

**Usage**

```
auc(actual, predicted)
```

**Arguments**

actual	The ground truth binary numeric vector containing 1 for the positive class and 0 for the negative class.
predicted	A numeric vector of predicted values, where the smallest values correspond to the observations most believed to be in the negative class and the largest values indicate the observations most believed to be in the positive class. Each element represents the prediction for the corresponding element in actual.

### Details

auc uses the fact that the area under the ROC curve is equal to the probability that a randomly chosen positive observation has a higher predicted value than a randomly chosen negative value. In order to compute this probability, we can calculate the Mann-Whitney U statistic. This method is very fast, since we do not need to compute the ROC curve first.

### Examples

```
actual <- c(1, 1, 1, 0, 0, 0)
predicted <- c(0.9, 0.8, 0.4, 0.5, 0.3, 0.2)
auc(actual, predicted)
```

---

bias

*Bias*

---

### Description

bias computes the average amount by which actual is greater than predicted.

### Usage

```
bias(actual, predicted)
```

### Arguments

actual	The ground truth numeric vector.
predicted	The predicted numeric vector, where each element in the vector is a prediction for the corresponding element in actual.

### Details

If a model is unbiased `bias(actual, predicted)` should be close to zero. Bias is calculated by taking the average of `(actual - predicted)`.

### See Also

[percent\\_bias](#)

### Examples

```
actual <- c(1.1, 1.9, 3.0, 4.4, 5.0, 5.6)
predicted <- c(0.9, 1.8, 2.5, 4.5, 5.0, 6.2)
bias(actual, predicted)
```

---

ce	<i>Classification Error</i>
----	-----------------------------

---

**Description**

ce is defined as the proportion of elements in `actual` that are not equal to the corresponding element in `predicted`.

**Usage**

```
ce(actual, predicted)
```

**Arguments**

<code>actual</code>	The ground truth vector, where elements of the vector can be any variable type.
<code>predicted</code>	The predicted vector, where elements of the vector represent a prediction for the corresponding value in <code>actual</code> .

**See Also**

[accuracy](#)

**Examples**

```
actual <- c('a', 'a', 'c', 'b', 'c')
predicted <- c('a', 'b', 'c', 'b', 'a')
ce(actual, predicted)
```

---

f1	<i>F1 Score</i>
----	-----------------

---

**Description**

f1 computes the F1 Score in the context of information retrieval problems.

**Usage**

```
f1(actual, predicted)
```

**Arguments**

<code>actual</code>	The ground truth vector of relevant documents. The vector can contain any numeric or character values, order does not matter, and the vector does not need to be the same length as <code>predicted</code> .
<code>predicted</code>	The predicted vector of retrieved documents. The vector can contain any numeric or character values, order does not matter, and the vector does not need to be the same length as <code>actual</code> .

## Details

$f1$  is defined as  $2 * precision * recall / (precision + recall)$ . In the context of information retrieval problems, precision is the proportion of retrieved documents that are relevant to a query and recall is the proportion of relevant documents that are successfully retrieved by a query. If there are zero relevant documents that are retrieved, zero relevant documents, or zero predicted documents,  $f1$  is defined as  $0$ .

## See Also

[apk mapk](#)

## Examples

```
actual <- c('a', 'c', 'd')
predicted <- c('d', 'e')
f1(actual, predicted)
```

---

fbeta\_score

*F-beta Score*

---

## Description

`fbeta_score` computes a weighted harmonic mean of Precision and Recall. The beta parameter controls the weighting.

## Usage

```
fbeta_score(actual, predicted, beta = 1)
```

## Arguments

actual	The ground truth binary numeric vector containing 1 for the positive class and 0 for the negative class.
predicted	The predicted binary numeric vector containing 1 for the positive class and 0 for the negative class. Each element represents the prediction for the corresponding element in actual.
beta	A non-negative real number controlling how close the F-beta score is to either Precision or Recall. When beta is at the default of 1, the F-beta Score is exactly an equally weighted harmonic mean. The F-beta score will weight toward Precision when beta is less than one. The F-beta score will weight toward Recall when beta is greater than one.

## See Also

[precision recall](#)



**Examples**

```
actual <- c(1, 1, 1, 0, 0, 0)
predicted <- c(1, 0, 1, 1, 1, 1)
recall(actual, predicted)
```

---

**11***Log Loss*

---

**Description**

11 computes the elementwise log loss between two numeric vectors.

**Usage**

```
11(actual, predicted)
```

**Arguments**

actual	The ground truth binary numeric vector containing 1 for the positive class and 0 for the negative class.
predicted	A numeric vector of predicted values, where the values correspond to the probabilities that each observation in actual belongs to the positive class

**See Also**

[logLoss](#)

**Examples**

```
actual <- c(1, 1, 1, 0, 0, 0)
predicted <- c(0.9, 0.8, 0.4, 0.5, 0.3, 0.2)
11(actual, predicted)
```

---

**logLoss***Mean Log Loss*

---

**Description**

logLoss computes the average log loss between two numeric vectors.

**Usage**

```
logLoss(actual, predicted)
```

**Arguments**

actual	The ground truth binary numeric vector containing 1 for the positive class and 0 for the negative class.
predicted	A numeric vector of predicted values, where the values correspond to the probabilities that each observation in actual belongs to the positive class

**See Also**[l1](#)**Examples**

```
actual <- c(1, 1, 1, 0, 0, 0)
predicted <- c(0.9, 0.8, 0.4, 0.5, 0.3, 0.2)
logLoss(actual, predicted)
```

---

mae

*Mean Absolute Error*

---

**Description**

mae computes the average absolute difference between two numeric vectors.

**Usage**

```
mae(actual, predicted)
```

**Arguments**

actual	The ground truth numeric vector.
predicted	The predicted numeric vector, where each element in the vector is a prediction for the corresponding element in actual.

**See Also**[mdae](#) [mape](#)**Examples**

```
actual <- c(1.1, 1.9, 3.0, 4.4, 5.0, 5.6)
predicted <- c(0.9, 1.8, 2.5, 4.5, 5.0, 6.2)
mae(actual, predicted)
```

---

mape	<i>Mean Absolute Percent Error</i>
------	------------------------------------

---

**Description**

mape computes the average absolute percent difference between two numeric vectors.

**Usage**

```
mape(actual, predicted)
```

**Arguments**

actual	The ground truth numeric vector.
predicted	The predicted numeric vector, where each element in the vector is a prediction for the corresponding element in actual.

**Details**

mape is calculated as the average of  $(\text{actual} - \text{predicted}) / \text{abs}(\text{actual})$ . This means that the function will return  $-\text{Inf}$ ,  $\text{Inf}$ , or  $\text{NaN}$  if actual is zero. Due to the instability at or near zero, smape or mase are often used as alternatives.

**See Also**

[mae](#) [smape](#) [mase](#)

**Examples**

```
actual <- c(1.1, 1.9, 3.0, 4.4, 5.0, 5.6)
predicted <- c(0.9, 1.8, 2.5, 4.5, 5.0, 6.2)
mape(actual, predicted)
```

---

mapk	<i>Mean Average Precision at k</i>
------	------------------------------------

---

**Description**

mapk computes the mean average precision at k for a set of predictions, in the context of information retrieval problems.

**Usage**

```
mapk(k, actual, predicted)
```

**Arguments**

k	The number of elements of predicted to consider in the calculation.
actual	A list of vectors, where each vector represents a ground truth vector of relevant documents. In each vector, the elements can be numeric or character values, and the order of the elements does not matter.
predicted	A list of vectors, where each vector represents the predicted vector of retrieved documents for the corresponding element of actual. In each vector, the order of the elements does matter, with the elements believed most likely to be relevant at the beginning.

**Details**

mapk evaluates apk for each pair of elements from actual and predicted.

**See Also**

[apk f1](#)

**Examples**

```
actual <- list(c('a', 'b'), c('a'), c('x', 'y', 'b'))
predicted <- list(c('a', 'c', 'd'), c('x', 'b', 'a', 'b'), c('y'))
mapk(2, actual, predicted)
```

```
actual <- list(c(1, 5, 7, 9), c(2, 3), c(2, 5, 6))
predicted <- list(c(5, 6, 7, 8, 9), c(1, 2, 3), c(2, 4, 6, 8))
mapk(3, actual, predicted)
```

---

mase

---

*Mean Absolute Scaled Error*


---

**Description**

mase computes the mean absolute scaled error between two numeric vectors. This function is only intended for time series data, where actual and numeric are numeric vectors ordered by time.

**Usage**

```
mase(actual, predicted, step_size = 1)
```

**Arguments**

actual	The ground truth numeric vector ordered in time, with most recent observation at the end of the vector.
predicted	The predicted numeric vector ordered in time, where each element of the vector represents a prediction for the corresponding element of actual.

`step_size` A positive integer that specifies how many observations to look back in time in order to compute the naive forecast. The default is 1, which means that the naive forecast for the current time period is the actual value of the previous period. However, if actual and predictions were quarterly predictions over many years, letting `step_size = 4`, would mean that the naive forecast for the current time period would be the actual value from the same quarter last year. In this way, mase can account for seasonality.

### See Also

[smape](#) [mape](#)

### Examples

```
actual <- c(1.1, 1.9, 3.0, 4.4, 5.0, 5.6)
predicted <- c(0.9, 1.8, 2.5, 4.5, 5.0, 6.2)
step_size <- 1
mase(actual, predicted, step_size)
```

---

mdae

*Median Absolute Error*

---

### Description

`mdae` computes the median absolute difference between two numeric vectors.

### Usage

```
mdae(actual, predicted)
```

### Arguments

`actual` The ground truth numeric vector.

`predicted` The predicted numeric vector, where each element in the vector is a prediction for the corresponding element in `actual`.

### See Also

[mae](#) [mape](#)

### Examples

```
actual <- c(1.1, 1.9, 3.0, 4.4, 5.0, 5.6)
predicted <- c(0.9, 1.8, 2.5, 4.5, 5.0, 6.2)
mdae(actual, predicted)
```

---

MeanQuadraticWeightedKappa

*Mean Quadratic Weighted Kappa*

---

### Description

MeanQuadraticWeightedKappa computes the mean quadratic weighted kappa, which can optionally be weighted

### Usage

```
MeanQuadraticWeightedKappa(kappas, weights = rep(1, length(kappas)))
```

### Arguments

kappas	A numeric vector of possible kappas.
weights	An optional numeric vector of ratings.

### See Also

[ScoreQuadraticWeightedKappa](#)

### Examples

```
kappas <- c(0.3, 0.2, 0.2, 0.5, 0.1, 0.2)
weights <- c(1.0, 2.5, 1.0, 1.0, 2.0, 3.0)
MeanQuadraticWeightedKappa(kappas, weights)
```

---

mse

*Mean Squared Error*

---

### Description

mse computes the average squared difference between two numeric vectors.

### Usage

```
mse(actual, predicted)
```

### Arguments

actual	The ground truth numeric vector.
predicted	The predicted numeric vector, where each element in the vector is a prediction for the corresponding element in actual.

**See Also**[rmse mae](#)**Examples**

```
actual <- c(1.1, 1.9, 3.0, 4.4, 5.0, 5.6)
predicted <- c(0.9, 1.8, 2.5, 4.5, 5.0, 6.2)
mse(actual, predicted)
```

---

msle

*Mean Squared Log Error*

---

**Description**

msle computes the average of squared log error between two numeric vectors.

**Usage**

```
msle(actual, predicted)
```

**Arguments**

actual	The ground truth non-negative vector
predicted	The predicted non-negative vector, where each element in the vector is a prediction for the corresponding element in actual.

**Details**

msle adds one to both actual and predicted before taking the natural logarithm to avoid taking the natural log of zero. As a result, the function can be used if actual or predicted have zero-valued elements. But this function is not appropriate if either are negative valued.

**See Also**[rmsle sle](#)**Examples**

```
actual <- c(1.1, 1.9, 3.0, 4.4, 5.0, 5.6)
predicted <- c(0.9, 1.8, 2.5, 4.5, 5.0, 6.2)
msle(actual, predicted)
```

---

params\_binary      *Inherit Documentation for Binary Classification Metrics*

---

### Description

This object provides the documentation for the parameters of functions that provide binary classification metrics

### Arguments

actual	The ground truth binary numeric vector containing 1 for the positive class and 0 for the negative class.
predicted	The predicted binary numeric vector containing 1 for the positive class and 0 for the negative class. Each element represents the prediction for the corresponding element in actual.

---

params\_classification      *Inherit Documentation for Classification Metrics*

---

### Description

This object provides the documentation for the parameters of functions that provide classification metrics

### Arguments

actual	The ground truth vector, where elements of the vector can be any variable type.
predicted	The predicted vector, where elements of the vector represent a prediction for the corresponding value in actual.

---

params\_regression      *Inherit Documentation for Regression Metrics*

---

### Description

This object provides the documentation for the parameters of functions that provide regression metrics

### Arguments

actual	The ground truth numeric vector.
predicted	The predicted numeric vector, where each element in the vector is a prediction for the corresponding element in actual.



---

percent_bias	<i>Percent Bias</i>
--------------	---------------------

---

**Description**

percent\_bias computes the average amount that actual is greater than predicted as a percentage of the absolute value of actual.

**Usage**

```
percent_bias(actual, predicted)
```

**Arguments**

actual	The ground truth numeric vector.
predicted	The predicted numeric vector, where each element in the vector is a prediction for the corresponding element in actual.

**Details**

If a model is unbiased percent\_bias(actual, predicted) should be close to zero. Percent Bias is calculated by taking the average of (actual - predicted) / abs(actual) across all observations. percent\_bias will give -Inf, Inf, or NaN, if any elements of actual are 0.

**See Also**

[bias](#)

**Examples**

```
actual <- c(1.1, 1.9, 3.0, 4.4, 5.0, 5.6)
predicted <- c(0.9, 1.8, 2.5, 4.5, 5.0, 6.2)
percent_bias(actual, predicted)
```

---

precision	<i>Precision</i>
-----------	------------------

---

**Description**

precision computes proportion of observations predicted to be in the positive class (i.e. the element in predicted equals 1) that actually belong to the positive class (i.e. the element in actual equals 1)

**Usage**

```
precision(actual, predicted)
```

**Arguments**

actual	The ground truth binary numeric vector containing 1 for the positive class and 0 for the negative class.
predicted	The predicted binary numeric vector containing 1 for the positive class and 0 for the negative class. Each element represents the prediction for the corresponding element in actual.

**See Also**

[recall fbeta\\_score](#)

**Examples**

```
actual <- c(1, 1, 1, 0, 0, 0)
predicted <- c(1, 1, 1, 1, 1, 1)
precision(actual, predicted)
```

---

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

---

**Description**

rae computes the relative absolute error between two numeric vectors.

**Usage**

```
rae(actual, predicted)
```

**Arguments**

actual	The ground truth numeric vector.
predicted	The predicted numeric vector, where each element in the vector is a prediction for the corresponding element in actual.

**Details**

rae divides  $\text{sum}(\text{ae}(\text{actual}, \text{predicted}))$  by  $\text{sum}(\text{ae}(\text{actual}, \text{mean}(\text{actual})))$ , meaning that it provides the absolute error of the predictions relative to a naive model that predicted the mean for every data point.

**See Also**

[rse rrse](#)

**Examples**

```
actual <- c(1.1, 1.9, 3.0, 4.4, 5.0, 5.6)
predicted <- c(0.9, 1.8, 2.5, 4.5, 5.0, 6.2)
rrse(actual, predicted)
```

---

recall	<i>Recall</i>
--------	---------------

---

**Description**

recall computes proportion of observations in the positive class (i.e. the element in actual equals 1) that are predicted to be in the positive class (i.e. the element in predicted equals 1)

**Usage**

```
recall(actual, predicted)
```

**Arguments**

actual	The ground truth binary numeric vector containing 1 for the positive class and 0 for the negative class.
predicted	The predicted binary numeric vector containing 1 for the positive class and 0 for the negative class. Each element represents the prediction for the corresponding element in actual.

**See Also**

[precision fbeta\\_score](#)

**Examples**

```
actual <- c(1, 1, 1, 0, 0, 0)
predicted <- c(1, 0, 1, 1, 1, 1)
recall(actual, predicted)
```

---

rmse	<i>Root Mean Squared Error</i>
------	--------------------------------

---

**Description**

rmse computes the root mean squared error between two numeric vectors

**Usage**

```
rmse(actual, predicted)
```

**Arguments**

actual	The ground truth numeric vector.
predicted	The predicted numeric vector, where each element in the vector is a prediction for the corresponding element in actual.

**See Also**[mse](#)**Examples**

```
actual <- c(1.1, 1.9, 3.0, 4.4, 5.0, 5.6)
predicted <- c(0.9, 1.8, 2.5, 4.5, 5.0, 6.2)
rmsle(actual, predicted)
```

---

**rmsle***Root Mean Squared Log Error*

---

**Description**

rmsle computes the root mean squared log error between two numeric vectors.

**Usage**

```
rmsle(actual, predicted)
```

**Arguments**

actual	The ground truth non-negative vector
predicted	The predicted non-negative vector, where each element in the vector is a prediction for the corresponding element in actual.

**Details**

rmsle adds one to both actual and predicted before taking the natural logarithm to avoid taking the natural log of zero. As a result, the function can be used if actual or predicted have zero-valued elements. But this function is not appropriate if either are negative valued.

**See Also**[msle](#) [sle](#)**Examples**

```
actual <- c(1.1, 1.9, 3.0, 4.4, 5.0, 5.6)
predicted <- c(0.9, 1.8, 2.5, 4.5, 5.0, 6.2)
rmsle(actual, predicted)
```

---

rrse	<i>Root Relative Squared Error</i>
------	------------------------------------

---

**Description**

rrse computes the root relative squared error between two numeric vectors.

**Usage**

```
rrse(actual, predicted)
```

**Arguments**

actual	The ground truth numeric vector.
predicted	The predicted numeric vector, where each element in the vector is a prediction for the corresponding element in actual.

**Details**

rrse takes the square root of `sse(actual, predicted)` divided by `sse(actual, mean(actual))`, meaning that it provides the squared error of the predictions relative to a naive model that predicted the mean for every data point.

**See Also**

[rse](#) [rae](#)

**Examples**

```
actual <- c(1.1, 1.9, 3.0, 4.4, 5.0, 5.6)
predicted <- c(0.9, 1.8, 2.5, 4.5, 5.0, 6.2)
rrse(actual, predicted)
```

---

rse	<i>Relative Squared Error</i>
-----	-------------------------------

---

**Description**

rse computes the relative squared error between two numeric vectors.

**Usage**

```
rse(actual, predicted)
```

**Arguments**

actual	The ground truth numeric vector.
predicted	The predicted numeric vector, where each element in the vector is a prediction for the corresponding element in actual.

**Details**

rse divides `sse(actual, predicted)` by `sse(actual, mean(actual))`, meaning that it provides the squared error of the predictions relative to a naive model that predicted the mean for every data point.

**See Also**

[rrse rae](#)

**Examples**

```
actual <- c(1.1, 1.9, 3.0, 4.4, 5.0, 5.6)
predicted <- c(0.9, 1.8, 2.5, 4.5, 5.0, 6.2)
rse(actual, predicted)
```

---

ScoreQuadraticWeightedKappa

*Quadratic Weighted Kappa*

---

**Description**

ScoreQuadraticWeightedKappa computes the quadratic weighted kappa between two vectors of integers

**Usage**

```
ScoreQuadraticWeightedKappa(rater.a, rater.b, min.rating = min(c(rater.a,
  rater.b)), max.rating = max(c(rater.a, rater.b)))
```

**Arguments**

rater.a	An integer vector of the first rater's ratings.
rater.b	An integer vector of the second rater's ratings.
min.rating	The minimum possible rating.
max.rating	The maximum possible rating.

**See Also**

[MeanQuadraticWeightedKappa](#)

**Examples**

```
rater.a <- c(1, 4, 5, 5, 2, 1)
rater.b <- c(2, 2, 4, 5, 3, 3)
ScoreQuadraticWeightedKappa(rater.a, rater.b, 1, 5)
```

---

se *Squared Error*

---

**Description**

se computes the elementwise squared difference between two numeric vectors.

**Usage**

```
se(actual, predicted)
```

**Arguments**

actual	The ground truth numeric vector.
predicted	The predicted numeric vector, where each element in the vector is a prediction for the corresponding element in actual.

**See Also**

[mse](#) [rmse](#)

**Examples**

```
actual <- c(1.1, 1.9, 3.0, 4.4, 5.0, 5.6)
predicted <- c(0.9, 1.8, 2.5, 4.5, 5.0, 6.2)
se(actual, predicted)
```

---

sle *Squared Log Error*

---

**Description**

sle computes the elementwise squares of the differences in the logs of two numeric vectors.

**Usage**

```
sle(actual, predicted)
```

**Arguments**

actual	The ground truth non-negative vector
predicted	The predicted non-negative vector, where each element in the vector is a prediction for the corresponding element in actual.

**Details**

sle adds one to both actual and predicted before taking the natural logarithm of each to avoid taking the natural log of zero. As a result, the function can be used if actual or predicted have zero-valued elements. But this function is not appropriate if either are negative valued.

**See Also**

[msle](#) [rmsle](#)

**Examples**

```
actual <- c(1.1, 1.9, 3.0, 4.4, 5.0, 5.6)
predicted <- c(0.9, 1.8, 2.5, 4.5, 5.0, 6.2)
sle(actual, predicted)
```

---

 smape

---

*Symmetric Mean Absolute Percentage Error*


---

**Description**

smape computes the symmetric mean absolute percentage error between two numeric vectors.

**Usage**

```
smape(actual, predicted)
```

**Arguments**

actual	The ground truth numeric vector.
predicted	The predicted numeric vector, where each element in the vector is a prediction for the corresponding element in actual.

**Details**

smape is defined as two times the average of  $\text{abs}(\text{actual} - \text{predicted}) / (\text{abs}(\text{actual}) + \text{abs}(\text{predicted}))$ . Therefore, at the elementwise level, it will provide NaN only if actual and predicted are both zero. It has an upper bound of 2, when either actual or predicted are zero or when actual and predicted are opposite signs.

smape is symmetric in the sense that  $\text{smape}(x, y) = \text{smape}(y, x)$ .



**See Also**[mape](#) [mase](#)**Examples**

```
actual <- c(1.1, 1.9, 3.0, 4.4, 5.0, 5.6)
predicted <- c(0.9, 1.8, 2.5, 4.5, 5.0, 6.2)
smape(actual, predicted)
```

---

sse	<i>Sum of Squared Errors</i>
-----	------------------------------

---

**Description**

sse computes the sum of the squared differences between two numeric vectors.

**Usage**

```
sse(actual, predicted)
```

**Arguments**

actual	The ground truth numeric vector.
predicted	The predicted numeric vector, where each element in the vector is a prediction for the corresponding element in actual.

**See Also**[mse](#)**Examples**

```
actual <- c(1.1, 1.9, 3.0, 4.4, 5.0, 5.6)
predicted <- c(0.9, 1.8, 2.5, 4.5, 5.0, 6.2)
sse(actual, predicted)
```

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