

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

URL <https://github.com/mfrasco/Metrics>

BugReports <https://github.com/mfrasco/Metrics/issues>

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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 $-\text{Inf}$, Inf , or 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 *Classification Error*

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

| | |
|-----------|--|
| 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

[accuracy](#)

Examples

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

f1 *F1 Score*

Description

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

Usage

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

Arguments

| | |
|-----------|--|
| 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, order does not matter, and the vector does not need to be the same length as actual. |

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)
```

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*Log Loss***Description**

ll computes the elementwise log loss between two numeric vectors.

Usage

```
ll(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)
ll(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 $-\text{Inf}$, Inf , or 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 | <i>Median Absolute Error</i> |
|------|------------------------------|

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

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

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 `sum(ae(actual, predicted))` by `sum(ae(actual, mean(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 *Root Relative Squared Error*

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 *Relative Squared Error*

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 | <i>Squared Error</i> |
|----|----------------------|

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 | <i>Squared Log Error</i> |
|-----|--------------------------|

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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