

Package ‘wordmap’

June 18, 2024

Type Package

Title Feature Extraction and Document Classification with Noisy Labels

Version 0.8.0

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Description Extract features and classify documents with noisy labels given by document-meta data or keyword matching Watanabe & Zhou (2020) <doi:10.1177/0894439320907027>.

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URL <https://github.com/koheiw/wordmap>

BugReports <https://github.com/koheiw/wordmap/issues>

LazyData TRUE

Encoding UTF-8

Depends R (>= 3.5), methods

Imports utils, Matrix, quanteda (>= 2.1), stringi

Suggests spelling, testthat, newsmap

Language en-US

RoxygenNote 7.3.1

NeedsCompilation no

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Repository CRAN

Date/Publication 2024-06-18 15:20:02 UTC

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accuracy	<i>Evaluate classification accuracy in precision and recall</i>
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Description

accuracy() counts the number of true positive, false positive, true negative, and false negative cases for each predicted class and calculates precision, recall and F1 score based on these counts. summary() calculates micro-average precision and recall, and macro-average precision and recall based on the output of accuracy().

Usage

```
accuracy(x, y)
```

```
## S3 method for class 'textmodel_wordmap_accuracy'
summary(object, ...)
```

Arguments

x	vector of predicted classes.
y	vector of true classes.
object	output of accuracy().
...	not used.

Value

accuracy() returns a data.frame with following columns:

tp	the number of true positive cases.
fp	the number of false positive cases.
tn	the number of true negative cases.
fn	the number of false negative cases.
precision	$tp/(tp + fp)$.
recall	$tp/(tp + fn)$.
f1	the harmonic mean of precision and recall.

summary() returns a named numeric vector with the following elements:

p	micro-average precision.
r	micro-average recall
P	macro-average precision.
R	macro-average recall.

Examples

```
class_pred <- c('US', 'GB', 'US', 'CN', 'JP', 'FR', 'CN') # prediction
class_true <- c('US', 'FR', 'US', 'CN', 'KP', 'EG', 'US') # true class
acc <- accuracy(class_pred, class_true)
print(acc)
summary(acc)
```

afe

Compute Average Feature Entropy (AFE)

Description

`afe()` computes Average Feature Entropy (AFE), which measures randomness of occurrences of features in labelled documents (Watanabe & Zhou, 2020). In creating seed dictionaries, AFE can be used to avoid adding seed words that would decrease classification accuracy.

Usage

```
afe(x, y, smooth = 1)
```

Arguments

<code>x</code>	a dfm for features.
<code>y</code>	a dfm for labels.
<code>smooth</code>	a numeric value for smoothing to include all the features.

Value

Returns a single numeric value.

References

Watanabe, Kohei & Zhou, Yuan (2020). "Theory-Driven Analysis of Large Corpora: Semisupervised Topic Classification of the UN Speeches". doi:10.1177/0894439320907027. *Social Science Computer Review*.

```
as.dictionary.textmodel_wordmap
```

Create lexicon from a Wordmap model

Description

as.list() returns features with the largest coefficients as a list of character vector. as.dictionary() returns a [quanteda::dictionary](#) object that can be use for dictionary analysis.

Usage

```
## S3 method for class 'textmodel_wordmap'
as.dictionary(x, separator = NULL, ...)
```

```
## S3 method for class 'textmodel_wordmap'
as.list(x, ...)
```

Arguments

x	a model fitted by textmodel_wordmap() .
separator	the character in between multi-word dictionary values. If NULL, x\$concatenator will be used.
...	passed to coef.textmodel_wordmap

Value

Returns a list or a [quanteda::dictionary](#) object.

```
coef.textmodel_wordmap
```

Extract coefficients from a Wordmap model

Description

coef() extracts top n features with largest coefficients for each class.

Usage

```
## S3 method for class 'textmodel_wordmap'
coef(object, n = 10, select = NULL, ...)
```

```
## S3 method for class 'textmodel_wordmap'
coefficients(object, n = 10, select = NULL, ...)
```

Arguments

object	a model fitted by <code>textmodel_wordmap()</code> .
n	the number of coefficients to extract.
select	returns the coefficients for the selected class; specify by the names of rows in <code>object\$model</code> .
...	not used.

Value

Returns a list of named numeric vectors sorted in descending order.

data_corpus_ungd2017 *UN General Debate speeches from 2017*

Description

A corpus of 196 speeches from the 2017 UN General Debate (Mikhaylov and Baturo, 2017). The economic data for 2017 (GDP and GDP per capita) are downloaded from the World Bank website.

Usage

```
data_corpus_ungd2017
```

Format

The corpus includes the following document variables:

country_iso ISO3c country code, e.g. "AFG" for Afghanistan

un_session UN session, a numeric identifier (in this case, 72)

year 4-digit year (2017).

country country name, in English.

continent continent of the country, one of: Africa, Americas, Asia, Europe, Oceania. Note that the speech delivered on behalf of the European Union is coded as "Europe".

gdp GDP in \$US for 2017, from the World Bank. Contains missing values for 9 countries.

gdp_per_capita GDP per capita in \$US for 2017, derived from the World Bank. Contains missing values for 9 countries.

Source

Mikhaylov, M., Baturo, A., & Dasandi, N. (2017). "United Nations General Debate Corpus". doi:10.7910/DVN/0TJX8Y. Harvard Dataverse, V4.

References

Baturo, A., Dasandi, N., & Mikhaylov, S. (2017). "Understanding State Preferences With Text As Data: Introducing the UN General Debate Corpus". doi:10.1177/2053168017712821. *Research and Politics*.

data_dictionary_topic *Seed topic dictionary*

Description

A dictionary with seed words for size common topics at the United Nations General Assembly (Watanabe and Zhou, 2020).

Usage

```
data_dictionary_topic
```

Format

An object of class dictionary2 of length 6.

Author(s)

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References

Watanabe, Kohei & Zhou, Yuan (2020). "Theory-Driven Analysis of Large Corpora: Semisupervised Topic Classification of the UN Speeches". doi:10.1177/0894439320907027. *Social Science Computer Review*.

predict.textmodel_wordmap

Predict the most likely class of documents

Description

Predict document class using fitted Wordmap models.

Usage

```
## S3 method for class 'textmodel_wordmap'  
predict(  
  object,  
  newdata = NULL,  
  confidence = FALSE,  
  rank = 1L,  
  type = c("top", "all"),  
  rescale = FALSE,  
  min_conf = -Inf,  
  min_n = 0L,  
  ...  
)
```

Arguments

object	a model fitted by <code>textmodel_wordmap()</code> .
newdata	a dfm on which prediction will be made.
confidence	if TRUE, it returns likelihood ratio scores.
rank	rank of the class to be predicted. Only used when <code>type = "top"</code> .
type	if top, returns the most likely class specified by rank; otherwise return a matrix of likelihood ratio scores for all possible classes.
rescale	if TRUE, likelihood ratio scores are normalized using <code>scale()</code> . This affects both types of results.
min_conf	returns NA when confidence is lower than this value.
min_n	set the minimum number of polarity words in documents.
...	not used.

Value

Returns predicted classes as a vector. If `confidence = TRUE`, it returns a list of two vectors:

class	predicted classes of documents.
confidence.fit	the confidence of predictions.

textmodel_wordmap	<i>A model for multinomial feature extraction and document classification</i>
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Description

Wordmap is a model for multinomial feature extraction and document classification. Its naive Bayesian algorithm allows users to train the model on a large corpus with noisy labels given by document meta-data or keyword matching.

Usage

```
textmodel_wordmap(
  x,
  y,
  label = c("all", "max"),
  smooth = 1,
  boolean = FALSE,
  drop_label = TRUE,
  verbose = quanteda_options("verbose"),
  entropy = c("none", "global", "local", "average"),
  ...
)
```

Arguments

x	a dfm or fcm created by <code>quanteda::dfm()</code>
y	a dfm or a sparse matrix that record class membership of the documents. It can be created applying <code>quanteda::dfm_lookup()</code> to x.
label	if "max", uses only labels for the maximum value in each row of y.
smooth	a value added to the frequency of words to smooth likelihood ratios.
boolean	if TRUE, only consider presence or absence of features in each document to limit the impact of words repeated in few documents.
drop_label	if TRUE, drops empty columns of y and ignore their labels.
verbose	if TRUE, shows progress of training.
entropy	[experimental] the scheme to compute the entropy to regularize likelihood ratios. The entropy of features are computed over labels if <code>global</code> or over documents with the same labels if <code>local</code> . Local entropy is averaged if <code>average</code> . See the details.
...	additional arguments passed to internal functions.

Details

Wordmap learns association between words and classes as likelihood ratios based on the features in x and the labels in y. The large likelihood ratios tend to concentrate to a small number of features but the entropy of their frequencies over labels or documents helps to disperse the distribution.

Value

Returns a fitted `textmodel_wordmap` object with the following elements:

model	a matrix that records the association between classes and features.
data	the original input of x.
feature	the feature set in the model.
concatenator	the concatenator in x.
entropy	the type of entropy weights used.
boolean	the use of the Boolean transformation of x.
call	the command used to execute the function.
version	the version of the wordmap package.

References

- Watanabe, Kohei (2018). "Newsmap: semi-supervised approach to geographical news classification". doi.org/10.1080/21670811.2017.1293487, *Digital Journalism*.
- Watanabe, Kohei & Zhou, Yuan (2020). "Theory-Driven Analysis of Large Corpora: Semisupervised Topic Classification of the UN Speeches". doi:10.1177/0894439320907027. *Social Science Computer Review*.

Examples

```
require(quanteda)

# split into sentences
corp <- corpus_reshape(data_corpus_ungd2017)

# tokenize
toks <- tokens(corp, remove_punct = TRUE) %>%
  tokens_remove(stopwords("en"))

# apply seed dictionary
toks_dict <- tokens_lookup(toks, data_dictionary_topic)

# form dfm
dfmt_feat <- dfm(toks)
dfmt_dict <- dfm(toks_dict)

# fit wordmap model
map <- textmodel_wordmap(dfmt_feat, dfmt_dict)
coef(map)
predict(map)
```

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