Package 'stylo'

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URL https://github.com/computationalstylistics/stylo

Depends R (>= 3.0)

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Description Supervised and unsupervised multivariate methods, supplemented by GUI and some visualizations, to perform various analyses in the field of computational stylistics, authorship attribution, etc. For further reference, see Eder et al. (2016), <https://journal.r-project.org/articles/RJ-2016-007/index.html>. You are also encouraged to visit the Computational Stylistics Group's website <https://computationalstylistics.github.io/>, where a reasonable amount of information about the package and related projects are provided.

License GPL (>= 3)

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Contents

`assign.plot.colors` *Assign colors to samples*

Description

Function that assigns unique colors to each class represented in a corpus: used for graph auto-coloring.

Usage

```
assign.plot.colors(labels, col = "colors", opacity = 1)
```

Arguments

`labels`	a vector containing the names of the samples in a corpus; it is obligatory to use an underscore as a class delimiter. Consider the following examples: c("Sterne_Tristram", "Sterne_Sentimental", "Fielding_Tom", ...), where the classes are the authors' names, and c("M_Joyce_Dubliners", "F_Woolf_Night_and_day", "M_Conrad_Lord_Jim", ...), where the classes are M(ale) and F(emale) according to authors' gender. Note that only the part up to the first underscore in the sample's name will be included in the class label.
`col`	an optional argument specifying the color palette to be used: "colors" for full-color output (default), "greyscale" for greyscale (useful for preparing publishable pictures), and "black", if no colors should be used.
`opacity`	optional argument to set transparency/opacity of the colors. 0 means full transparency, 1 means full opacity (default).

Details

Function for graph auto-coloring; depending on the user's choice it assigns either colors or greyscale tones to matching strings of characters which stand for class identifiers. These metadata will typically be encoded in the texts' filenames. (As class delimiter, the underscore character should be used). Alternatively, all labels can be plotted in black.

Value

The function returns a vector of colors, using their conventional names (e.g. `red`, `maroon4`, `mediumturquoise`, `gold4`, `deepskyblue`, ...), or numeric values if the greyscale option was chosen (e.g. `#000000`, `#000000`, `#595959`, `#B2B2B2`, ...).

Author(s)

Maciej Eder

Examples

```
# in this example, three discrete classes are specified,
# for Tacitus, Caesar, and Livius
sample.names = c("Tacitus_Annales","Tacitus_Germania","Tacitus_Histories",
                 "Caesar_Civil_wars","Caesar_Gallic_wars",
                 "Livius_Ab_Urbe_Condita")
assign.plot.colors(sample.names)

# as above, but using greyscale:
assign.plot.colors(sample.names, col = "greyscale")
```

---

change.encoding *Change character encoding*

Description

This function is a wrapper around `iconv()` that allows for converting character encoding of multiple text files in a corpus folder, preferably into UTF-8.

Usage

```
change.encoding(corpus.dir = "corpus/", from, to = "utf-8",
                keep.original = TRUE, output.dir = NULL)
```

Arguments

`corpus.dir`	path to the folder containing the corpus.
`from`	original character encoding. See the Details section (below) for some hints on how to get the original encoding.
`to`	character encoding to convert into.
`keep.original`	shall the original files be stored?
`output.dir`	folder for the reencoded files.

Details

Stylo works on UTF-8-enconded texts by default. This function allows you to convert your corpus, if not yet encoded in UTF-8. To check the current encoding of text files in your corpus folder, you can use the function `check.encoding()`.

Value

The function saves reencoded text files.

Author(s)

Steffen Pielström

See Also

check.encoding

Examples

```
## Not run:
# To replace the old versions with the newly encoded, but retain them
# in another folder:
change.encoding = function(corpus.dir = "~/corpora/example/",
                           from = "ASCII", to = "utf-8")

# To place the new version in another folder called "utf8/":
change.encoding = function(corpus.dir = "~/corpora/example/",
                           from = "ASCII",
                           to = "utf-8",
                           output.dir = "utf8/")

# To simply replace the old version:
change.encoding = function(corpus.dir = "~/corpora/example/",
                           from = "ASCII",
                           to = "utf-8",
                           keep.original = FALSE)

## End(Not run)
```

---

check.encoding *Check character encoding in corpus folder*

Description

Using non-ASCII characters is never trivial, but sometimes unavoidable. Specifically, most of the world's languages use non-Latin alphabets or diacritics added to the standard Latin script. The default character encoding in stylo is UTF-8, deviating from it can cause problems. This function allows users to check the character encoding in a corpus. A summary is returned to the termial and a detailed list reporting the most probable encodings of all the text files in the folder can be written to a csv file. The function is basically a wrapper around the function `guess_encoding()` from the 'readr' package by Wickham et al. (2017). To change the encoding to UTF-8, try the `change.encoding()` function.

Usage

```
check.encoding(corpus.dir = "corpus/", output.file = NULL)
```

Arguments

`corpus.dir`	path to the folder containing the corpus.
`output.file`	path to a csv file that reports the most probable encoding for each text file in the corpus.

Details

If no additional argument is passed, then the function tries to check the text files in the default subdirectory `corpus`.

Value

The function returns a summary message and writes detailed results into a csv file.

Author(s)

Steffen Pielström

References

Wickham , H., Hester, J., Francois, R., Jylanki, J., and Jørgensen, M. (2017). Package: 'readr'. <https://cran.r-project.org/web/packages/readr/readr.pdf>.

See Also

`change.encoding`

Examples

```
## Not run:
# standard usage from stylo working directory with a 'corpus' subfolder:
check.encoding()

# specifying another folder:
check.encoding("~/corpora/example1/")

# specifying an output file:
check.encoding(output.file = "~/experiments/charencoding/example1.csv")


## End(Not run)
```

`classify` *Machine-learning supervised classification*

Description

Function that performs a number of machine-learning methods for classification used in computational stylistics: Delta (Burrows, 2002), k-Nearest Neighbors, Support Vector Machines, Naive Bayes, and Nearest Shrunken Centroids (Jockers and Witten, 2010). Most of the options are derived from the `stylo` function.

Usage

```
classify(gui = TRUE, training.frequencies = NULL, test.frequencies = NULL,
         training.corpus = NULL, test.corpus = NULL, features = NULL,
         path = NULL, training.corpus.dir = "primary_set",
         test.corpus.dir = "secondary_set", ...)
```

Arguments

`gui`	an optional argument; if switched on, a simple yet effective graphical user interface (GUI) will appear. Default value is `TRUE`.
`training.frequencies`	using this optional argument, one can load a custom table containing frequencies/counts for several variables, e.g. most frequent words, across a number of text samples (for the training set). It can be either an R object (matrix or data frame), or a filename containing tab-delimited data. If you use an R object, make sure that the rows contain samples, and the columns – variables (words). If you use an external file, the variables should go vertically (i.e. in rows): this is because files containing vertically-oriented tables are far more flexible and easily editable using, say, Excel or any text editor. To flip your table horizontally/vertically use the generic function `t()`.
`test.frequencies`	using this optional argument, one can load a custom table containing frequencies/counts for the test set. Further details: immediately above.
`training.corpus`	another option is to pass a pre-processed corpus as an argument (here: the training set). It is assumed that this object is a list, each element of which is a vector containing one tokenized sample. The example shown below will give you some hints how to prepare such a corpus. Also, refer to `help(load.corpus.and.parse)`
`test.corpus`	if `training.corpus` is used, then you should also prepare a similar R object containing the test set.
`features`	usually, a number of the most frequent features (words, word n-grams, character n-grams) are extracted automatically from the corpus, and they are used as variables for further analysis. However, in some cases it makes sense to use a set of tailored features, e.g. the words that are associated with emotions or, say, a specific subset of function words. This optional argument allows to pass either a filename containing your custom list of features, or a vector (R object) of features to be assessed.
`path`	if not specified, the current directory will be used for input/output procedures (reading files, outputting the results).
`training.corpus.dir`	the subdirectory (within the current working directory) that contains the training set, or the collection of texts used to exemplify the differences between particular classes (e.g. authors or genres). The discriminating features extracted from this training material will be used during the testing procedure (see below). If not specified, the default subdirectory `primary_set` will be used.

`test.corpus.dir`
: the subdirectory (within the working directory) that contains the test set, or the collection of texts that are used to test the effectiveness of the discriminative features extracted from the training set. In the case of authorship attribution e.g., this set might contain works of non-disputed authorship, in order to check whether a classification procedure attribute the tets texts to their correct author. This set contains 'new' or 'unseen' data (e.g. anonymous samples or samples of disputed authorship in the case of authorship studies). If not specified, the default subdirectory `secondary_set` will be used.

`...`
: any variable as produced by `stylo.default.settings()` can be set here to overwrite the default values.

Details

There are numerous additional options that are passed to this function; so far, they are all loaded when `stylo.default.settings()` is executed (it will be invoked automatically from inside this function); the user can set/change them in the GUI.

Value

The function returns an object of the class `stylo.results`: a list of variables, including tables of word frequencies, vector of features used, a distance table and some more stuff. Additionally, depending on which options have been chosen, the function produces a number of files used to save the results, features assessed, generated tables of distances, etc.

Author(s)

Maciej Eder, Mike Kestemont

References

Eder, M., Rybicki, J. and Kestemont, M. (2016). Stylometry with R: a package for computational text analysis. "R Journal", 8(1): 107-21.

Burrows, J. F. (2002). "Delta": a measure of stylistic difference and a guide to likely authorship. "Literary and Linguistic Computing", 17(3): 267-87.

Jockers, M. L. and Witten, D. M. (2010). A comparative study of machine learning methods for authorship attribution. "Literary and Linguistic Computing", 25(2): 215-23.

Argamon, S. (2008). Interpreting Burrows's Delta: geometric and probabilistic foundations. "Literary and Linguistic Computing", 23(2): 131-47.

See Also

`stylo`, `rolling.delta`, `oppose`

Examples

```
## Not run:
# standard usage (it builds a corpus from a collection of text files):
classify()
```

```
# loading word frequencies from two tab-delimited files:
classify(training.frequencies = "table_with_training_frequencies.txt",
         test.frequencies = "table_with_test_frequencies.txt")


# using two existing sub-corpora (a list containing tokenized texts):
txt1 = c("now", "i", "am", "alone", "o", "what", "a", "slave", "am", "i")
txt2 = c("what", "do", "you", "read", "my", "lord")
  setTRAIN = list(txt1, txt2)
  names(setTRAIN) = c("hamlet_sample1","polonius_sample1")
txt4 = c("to", "be", "or", "not", "to", "be")
txt5 = c("though", "this", "be", "madness", "yet", "there", "is", "method")
txt6 = c("the", "rest", "is", "silence")
  setTEST = list(txt4, txt5, txt6)
  names(setTEST) = c("hamlet_sample2", "polonius_sample2", "uncertain_1")
classify(training.corpus = setTRAIN, test.corpus = setTEST)


# using a custom set of features (words, n-grams) to be analyzed:
my.selection.of.function.words = c("the", "and", "of", "in", "if", "into",
                                   "within", "on", "upon", "since")
classify(features = my.selection.of.function.words)


# loading a custom set of features (words, n-grams) from a file:
classify(features = "wordlist.txt")


# batch mode, custom name of corpus directories:
my.test = classify(gui = FALSE, training.corpus.dir = "TrainingSet",
       test.corpus.dir = "TestSet")
summary(my.test)


# batch mode, character 3-grams requested:
classify(gui = FALSE, analyzed.features = "c", ngram.size = 3)


## End(Not run)
```

`crossv` *Function to Perform Cross-Validation*

Description

Function for performing a classification iteratively, while in each iteration the composition of the train set and the test set is re-shuffled. There are a few cross-validation flavors available; the current function supports (i) stratified cross-validation, which means that in N iterations, the train/test sets

are assigned randomly, but the exact number of texts representing the original classes in the train set are keept unchanged; (ii) leave-one-out cross-validation, which moves one sample from the train set to the test set, performs a classification, and then repeates the same procedure untill the available samples are exhausted.

Usage

```
crossv(training.set, test.set = NULL,
       cv.mode = "leaveoneout", cv.folds = 10,
       classes.training.set = NULL, classes.test.set = NULL,
       classification.method = "delta", ...)
```

Arguments

`training.set`	a table containing frequencies/counts for several variables – e.g. most frequent words – across a number of text samples (for the training set). Make sure that the rows contain samples, and the columns – variables (words, n-grams, or whatever needs to be analyzed).
`test.set`	a table containing frequencies/counts for the training set. The variables used (i.e. columns) must match the columns of the training set. If the leave-one-out cross-validation flavor was chosen, then the test set is not obligatory: it will be created automatically. If the test set is present, however, it will be used as a "new" dataset for predicting its classes. It might seem a bit misleading – new versions will distinguish more precisely the (i) train set, (ii) validation set and (iii) test set in the strict sense.
`cv.mode`	choose "leaveoneout" to perform leave-one-out cross-validation; choose "stratified" to perform random selection of train samples in N iterations (see the `cv.folds` parameter below) out of the all the available samples, provided that the very number of samples representing the classes in the original train set is keept in each iterations.
`cv.folds`	the number of train/test set swaps, or cross-validation folds. A standard solution in the exact sciences seems to be a 10-fold cross-validation. It has been shown, however (Eder and Rybicki 2013) that in text analysis setups, this might be not enough. This option is immaterial with leave-one-out cross-validation, since the number of folds is always as high as the number of train samples.
`classes.training.set`	a vector containing class identifiers for the training set. When missing, the row names of the training set table will be used; the assumed classes are the strings of characters followed by the first underscore. Consider the following examples: c("Sterne_Tristram", "Sterne_Sentimental", "Fielding_Tom", ...), where the classes are the authors' names, and c("M_Joyce_Dubliners", "F_Woolf_Night_and_day", "M_Conrad_Lord_Jim", ...), where the classes are M(ale) and F(emale) according to authors' gender. Note that only the part up to the first underscore in the sample's name will be included in the class label.
`classes.test.set`	a vector containing class identifiers for the test set. When missing, the row names of the test set table will be used (see above).

`classification.method`
: the function invokes one of the classification methods provided by the package `stylo`. Choose one of the following: "delta", "svm", "knn", "nsc", "naivebayes".

`...`
: further parameters can be passed; they might be needed by particular classification methods. See `perform.delta`, `perform.svm`, `perform.nsc`, `perform.knn`, `perform.naivebayes` for further results.

Value

The function returns a vector of accuracy scores across specified cross-validation folds. The attributes of the vector contain a list of misattributed samples (attr "misattributions") and a list of confusion matrices for particular cv folds (attr "confusion_matrix").

Author(s)

Maciej Eder

See Also

`perform.delta`, `perform.svm`, `perform.nsc`, `perform.knn`, `perform.naivebayes`

Examples

```
## Not run:

## standard usage:
crossv(training.set, test.set)

## text categorization

# specify a table with frequencies
data(lee)
# perform a leave-one-out classification using kNN
results = crossv(lee, classification.method = "knn")
# inspect final results
performance.measures(results)



## stratified cross-validation

# specity a table with frequencies
data(galbraith)
freqs = galbraith
# specify class labels:
training.texts = c("coben_breaker", "coben_dropshot", "lewis_battle",
                   "lewis_caspian", "rowling_casual", "rowling_chamber",
                   "tolkien_lord1", "tolkien_lord2")
train.classes = match(training.texts,rownames(freqs))

# select the training samples:
training.set = freqs[train.classes,]
```

```
# select remaining rows as test samples:
test.set = freqs[-train.classes,]

crossv(training.set, test.set, cv.mode = "stratified")



# classifying the standard 'iris' dataset:
data(iris)
x = subset(iris, select = -Species)
train = rbind(x[1:25,], x[51:75,], x[101:125,])
test = rbind(x[26:50,], x[76:100,], x[126:150,])
train.classes = c(rep("s",25), rep("c",25), rep("v",25))
test.classes = c(rep("s",25), rep("c",25), rep("v",25))

crossv(train, test, cv.mode = "stratified", cv.folds = 10,
       train.classes, test.classes)


## End(Not run)
```

`define.plot.area` *Define area for scatterplots*

Description

Function that determines the size of a scatterplot, taking into consideration additional margin to fit longer labels appearing on a graph (if applicable), optional margin defined by user, and some space to offset scatterplot labels from points (if applicable).

Usage

```
define.plot.area(x.coord, y.coord, xymargins = 2, v.offset = 0)
```

Arguments

`x.coord`	a vector of x coordinates, optionally with names.
`y.coord`	a vector of y coordinates.
`xymargins`	additional margins (expressed as a % of the actual plot area).
`v.offset`	label offset (expressed as a % of the actual plot area).

Details

Function that finds out the coordinates of scatterplots: it computes the extreme x and y values, adds margins, and optionally extends the top margin if a plot uses sample labels. Automatic margin extension will only take place if the x coordinates are supplemented by their names (i.e. labels of points to be shown on scatterplot).

Author(s)

Maciej Eder

See Also

assign.plot.colors, stylo

Examples

```
# to determine the plotting area for 4 points:
define.plot.area( c(1,2,3,4), c(-0.001,0.11,-0.023,0.09))

# to determine plot coordinates, taking into consideration
# the objects' names
my.points = cbind(c(1,2,3,4),c(-0.001,0.11,-0.023,0.09))
rownames(my.points) = c("first","second","third","very_long_fourth")
define.plot.area(my.points[,1], my.points[,2])
```

---

delete.markup *Delete HTML or XML tags*

Description

Function for removing markup tags (e.g. HTML, XML) from a string of characters. All XML markup is assumed to be compliant with the TEI guidelines (as introduced by the TEI Consortium).

Usage

```
delete.markup(input.text, markup.type = "plain")
```

Arguments

input.text	any string of characters (e.g. vector) containing markup tags that have to be deleted.
markup.type	any of the following values: plain (nothing will happen), html (all <tags> will be deleted as well as HTML header), xml (TEI header, all strings between <note> </note> tags, and all the tags will be deleted), xml.drama (as above; but, additionally, speaker's names will be deleted, or strings within each the <speaker> </speaker> tags), xml.notitles (as above; but, additionally, all the chapter/section (sub)titles will be deleted, or strings within each the <head> </head> tags).

Details

This function needs to be used carefully: while a document formatted in compliance with the TEI guidelines will be parsed flawlessly, the cleaning up of an HTML page harvested randomly on the web might cause some side effects, e.g. the footers, disclaimers, etc. will not be removed.

Author(s)

Maciej Eder, Mike Kestemont

See Also

load.corpus, txt.to.words, txt.to.words.ext, txt.to.features

Examples

```
delete.markup("Gallia est omnis <i>divisa</i> in partes tres",
         markup.type = "html")

delete.markup("Gallia<note>Gallia: Gaul.</note> est omnis
         <emph>divisa</emph> in partes tres", markup.type = "xml")

delete.markup("<speaker>Hamlet</speaker>Words, words, words...",
         markup.type = "xml.drama")
```

---

delete.stop.words *Exclude stop words (e.g. pronouns, particles, etc.) from a dataset*

Description

Function for removing custom words from a dataset: it can be the so-called stop words (frequent words without much meaning), or personal pronouns, or other custom elements of a dataset. It can be used to cull certain words from a vector containing tokenized text (particular words as elements of the vector), or to exclude unwanted columns (variables) from a table with frequencies. See examples below.

Usage

```
delete.stop.words(input.data, stop.words = NULL)
```

Arguments

input.data	either a vector containing words (actually, any countable features), or a data matrix/frame. The former in case of culling stop words from running text, the latter for culling them from tables of frequencies (then particular columns are excluded). The table should be oriented to contain samples in rows, variables in columns, and variables' names should be accessible via colnames(input.table).
stop.words	a vector of words to be excluded.

Details

This function might be usefull to perform culling, or automatic deletion of the words that are too characteristic for particular texts. See help(culling) for further details.

Author(s)

Maciej Eder

See Also

stylo.pronouns, perform.culling

Examples

```
# (i) excluding stop words from a vector
my.text = c("omnis", "homines", "qui", "sese", "student", "praestare",
        "ceteris", "animalibus", "summa", "ope", "niti", "decet", "ne",
        "vitam", "silentio", "transeant", "veluti", "pecora", "quae",
        "natura", "prona", "atque", "ventri", "oboedientia", "finxit")
delete.stop.words(my.text, stop.words = c("qui", "quae", "ne", "atque"))


# (ii) excluding stop words from tabular data
#
# assume there is a matrix containing some frequencies
# (be aware that these counts are fictional):
t1 = c(2, 1, 0, 8, 9, 5, 6, 3, 4, 7)
t2 = c(7, 0, 5, 9, 1, 8, 6, 4, 2, 3)
t3 = c(5, 9, 2, 1, 6, 7, 8, 0, 3, 4)
t4 = c(2, 8, 6, 3, 0, 5, 9, 4, 7, 1)
my.data.table = rbind(t1, t2, t3, t4)

# names of the samples:
rownames(my.data.table) = c("text1", "text2", "text3", "text4")
# names of the variables (e.g. words):
colnames(my.data.table) = c("the", "of", "in", "she", "me", "you",
                                    "them", "if", "they", "he")
# the table looks as follows
print(my.data.table)

# now, one might want to get rid of the words "the", "of", "if":
delete.stop.words(my.data.table, stop.words = c("the", "of", "if"))

# also, some pre-defined lists of pronouns can be applied:
delete.stop.words(my.data.table,
                      stop.words = stylo.pronouns(corpus.lang = "English"))
```

`dist.cosine` *Cosine Distance*

Description

Function for computing a cosine similarity of a matrix of values, e.g. a table of word frequencies. Recent findings (Jannidis et al. 2015) show that this distance outperforms other nearest neighbor approaches in the domain of authorship attribution.

Usage

```
dist.cosine(x)
```

Arguments

x	a matrix or data table containing at least 2 rows and 2 cols, the samples (texts) to be compared in rows, the variables in columns.

Value

The function returns an object of the class `dist`, containing distances between each pair of samples. To convert it to a square matrix instead, use the generic function `as.dist`.

Author(s)

Maciej Eder

References

Evert, S., Proisl, T., Jannidis, F., Reger, I., Pielstrom, S., Schoch, C. and Vitt, T. (2017). Understanding and explaining Delta measures for authorship attribution. Digital Scholarship in the Humanities, 32(suppl. 2): 4-16.

See Also

`stylo`, `classify`, `dist`, `as.dist`

Examples

```
# first, preparing a table of word frequencies
        Iuvenalis_1 = c(3.939, 0.635, 1.143, 0.762, 0.423)
        Iuvenalis_2 = c(3.733, 0.822, 1.066, 0.933, 0.511)
        Tibullus_1  = c(2.835, 1.302, 0.804, 0.862, 0.881)
        Tibullus_2  = c(2.911, 0.436, 0.400, 0.946, 0.618)
        Tibullus_3  = c(1.893, 1.082, 0.991, 0.879, 1.487)
        dataset = rbind(Iuvenalis_1, Iuvenalis_2, Tibullus_1, Tibullus_2,
                        Tibullus_3)
        colnames(dataset) = c("et", "non", "in", "est", "nec")

# the table of frequencies looks as follows
        print(dataset)

# then, applying a distance, in two flavors
        dist.cosine(dataset)
        as.matrix(dist.cosine(dataset))
```

`dist.delta` *Delta Distance*

Description

Function for computing Delta similarity measure of a matrix of values, e.g. a table of word frequencies. Apart from the Classic Delta, two other flavors of the measure are supported: Argamon's Delta and Eder's Delta. There are also non-Delta distant measures available: see e.g. `dist.cosine` and `dist.simple`.

Usage

```
dist.delta(x, scale = TRUE)

dist.argamon(x, scale = TRUE)

dist.eder(x, scale = TRUE)
```

Arguments

`x`	a matrix or data table containing at least 2 rows and 2 cols, the samples (texts) to be compared in rows, the variables in columns.
`scale`	the Delta measure relies on scaled frequencies – if you have your matrix scaled already (i.e. converted to z-scores), switch this option off. Default: TRUE.

Value

The function returns an object of the class `dist`, containing distances between each pair of samples. To convert it to a square matrix instead, use the generic function `as.dist`.

Author(s)

Maciej Eder

References

Argamon, S. (2008). Interpreting Burrows's Delta: geometric and probabilistic foundations. "Literary and Linguistic Computing", 23(2): 131-147.

Burrows, J. F. (2002). "Delta": a measure of stylistic difference and a guide to likely authorship. "Literary and Linguistic Computing", 17(3): 267-287.

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See Also

stylo, classify, dist.cosine, as.dist

Examples

```
# first, preparing a table of word frequencies
        Iuvenalis_1 = c(3.939, 0.635, 1.143, 0.762, 0.423)
        Iuvenalis_2 = c(3.733, 0.822, 1.066, 0.933, 0.511)
        Tibullus_1  = c(2.835, 1.302, 0.804, 0.862, 0.881)
        Tibullus_2  = c(2.911, 0.436, 0.400, 0.946, 0.618)
        Tibullus_3  = c(1.893, 1.082, 0.991, 0.879, 1.487)
        dataset = rbind(Iuvenalis_1, Iuvenalis_2, Tibullus_1, Tibullus_2,
                        Tibullus_3)
        colnames(dataset) = c("et", "non", "in", "est", "nec")

# the table of frequencies looks as follows
        print(dataset)

# then, applying a distance
        dist.delta(dataset)
        dist.argamon(dataset)
        dist.eder(dataset)

# converting to a regular matrix
        as.matrix(dist.delta(dataset))
```

---

dist.entropy *Entropy Distance*

Description

Function for computing the entropy distance measure between two (or more) vectors.

Usage

```
dist.entropy(x)
```

Arguments

x	a matrix or data table containing at least 2 rows and 2 cols, the samples (texts) to be compared in rows, the variables in columns.

Value

The function returns an object of the class `dist`, containing distances between each pair of samples. To convert it to a square matrix instead, use the generic function `as.dist`.

Author(s)

Maciej Eder

References

Juola, P. and Baayen, H. (2005). A controlled-corpus experiment in authorship attribution by cross-entropy. Literary and Linguistic Computing, 20(1): 59-67.

See Also

`stylo`, `classify`, `dist`, `as.dist`, `dist.cosine`

Examples

```
# first, preparing a table of word frequencies
        Iuvenalis_1 = c(3.939, 0.635, 1.143, 0.762, 0.423)
        Iuvenalis_2 = c(3.733, 0.822, 1.066, 0.933, 0.511)
        Tibullus_1  = c(2.835, 1.302, 0.804, 0.862, 0.881)
        Tibullus_2  = c(2.911, 0.436, 0.400, 0.946, 0.618)
        Tibullus_3  = c(1.893, 1.082, 0.991, 0.879, 1.487)
        dataset = rbind(Iuvenalis_1, Iuvenalis_2, Tibullus_1, Tibullus_2,
                        Tibullus_3)
        colnames(dataset) = c("et", "non", "in", "est", "nec")

# the table of frequencies looks as follows
        print(dataset)

# then, applying a distance, in two flavors
        dist.entropy(dataset)
        as.matrix(dist.entropy(dataset))
```

---

dist.minmax *Min-Max Distance (aka Ruzicka Distance)*

Description

Function for computing a similarity measure bewteen two (or more) vectors. Some scholars (Kestemont et at., 2016) claim that it works well when applied to authorship attribution problems.

Usage

```
dist.minmax(x)
```

Arguments

x	a matrix or data table containing at least 2 rows and 2 cols, the samples (texts) to be compared in rows, the variables in columns.

Value

The function returns an object of the class `dist`, containing distances between each pair of samples. To convert it to a square matrix instead, use the generic function `as.dist`.

Author(s)

Maciej Eder

References

Kestemont, M., Stover, J., Koppel, M., Karsdorp, F. and Daelemans, W. (2016). Authenticating the writings of Julius Caesar. Expert Systems With Applications, 63: 86-96.

See Also

`stylo`, `classify`, `dist`, `as.dist`, `dist.cosine`

Examples

```
# first, preparing a table of word frequencies
        Iuvenalis_1 = c(3.939, 0.635, 1.143, 0.762, 0.423)
        Iuvenalis_2 = c(3.733, 0.822, 1.066, 0.933, 0.511)
        Tibullus_1  = c(2.835, 1.302, 0.804, 0.862, 0.881)
        Tibullus_2  = c(2.911, 0.436, 0.400, 0.946, 0.618)
        Tibullus_3  = c(1.893, 1.082, 0.991, 0.879, 1.487)
        dataset = rbind(Iuvenalis_1, Iuvenalis_2, Tibullus_1, Tibullus_2,
                        Tibullus_3)
        colnames(dataset) = c("et", "non", "in", "est", "nec")

# the table of frequencies looks as follows
        print(dataset)

# then, applying a distance, in two flavors
        dist.minmax(dataset)
        as.matrix(dist.minmax(dataset))
```

---

dist.simple *Cosine Distance*

Description

Function for computing Eder's Simple distance of a matrix of values, e.g. a table of word frequencies. This is done by normalizing the input dataset by a square root function, and then applying Manhattan distance.

Usage

```
dist.simple(x)
```

Arguments

x	a matrix or data table containing at least 2 rows and 2 cols, the samples (texts) to be compared in rows, the variables in columns.

Value

The function returns an object of the class `dist`, containing distances between each pair of samples. To convert it to a square matrix instead, use the generic function `as.dist`.

Author(s)

Maciej Eder

See Also

`stylo`, `classify`, `dist.delta`, `as.dist`

Examples

```
# first, preparing a table of word frequencies
        Iuvenalis_1 = c(3.939, 0.635, 1.143, 0.762, 0.423)
        Iuvenalis_2 = c(3.733, 0.822, 1.066, 0.933, 0.511)
        Tibullus_1  = c(2.835, 1.302, 0.804, 0.862, 0.881)
        Tibullus_2  = c(2.911, 0.436, 0.400, 0.946, 0.618)
        Tibullus_3  = c(1.893, 1.082, 0.991, 0.879, 1.487)
        dataset = rbind(Iuvenalis_1, Iuvenalis_2, Tibullus_1, Tibullus_2,
                        Tibullus_3)
        colnames(dataset) = c("et", "non", "in", "est", "nec")

# the table of frequencies looks as follows
        print(dataset)

# then, applying a distance, in two flavors
        dist.simple(dataset)
        as.matrix(dist.simple(dataset))
```

---

dist.wurzburg *Cosine Delta Distance (aka Wurzburg Distance)*

Description

Function for computing a cosine similarity of a scaled (z-scored) matrix of values, e.g. a table of word frequencies. Recent findings by the briliant guys from Wurzburg (Jannidis et al. 2015) show that this distance outperforms other nearest neighbor approaches in the domain of authorship attribution.

Usage

```
dist.wurzburg(x)
```

Arguments

x	a matrix or data table containing at least 2 rows and 2 cols, the samples (texts) to be compared in rows, the variables in columns.

Value

The function returns an object of the class `dist`, containing distances between each pair of samples. To convert it to a square matrix instead, use the generic function `as.dist`.

Author(s)

Maciej Eder

References

Evert, S., Proisl, T., Jannidis, F., Reger, I., Pielstrom, S., Schoch, C. and Vitt, T. (2017). Understanding and explaining Delta measures for authorship attribution. Digital Scholarship in the Humanities, 32(suppl. 2): 4-16.

See Also

`stylo`, `classify`, `dist`, `as.dist`, `dist.cosine`

Examples

```
# first, preparing a table of word frequencies
        Iuvenalis_1 = c(3.939, 0.635, 1.143, 0.762, 0.423)
        Iuvenalis_2 = c(3.733, 0.822, 1.066, 0.933, 0.511)
        Tibullus_1  = c(2.835, 1.302, 0.804, 0.862, 0.881)
        Tibullus_2  = c(2.911, 0.436, 0.400, 0.946, 0.618)
        Tibullus_3  = c(1.893, 1.082, 0.991, 0.879, 1.487)
        dataset = rbind(Iuvenalis_1, Iuvenalis_2, Tibullus_1, Tibullus_2,
                        Tibullus_3)
        colnames(dataset) = c("et", "non", "in", "est", "nec")

# the table of frequencies looks as follows
        print(dataset)

# then, applying a distance, in two flavors
        dist.wurzburg(dataset)
        as.matrix(dist.wurzburg(dataset))
```

galbraith *Table of word frequencies (Galbraith, Rowling, Coben, Tolkien, Lewis)*

Description

This dataset contains a table (matrix) of relative frequencies of 3000 most frequent words retrieved from 26 books by 5 authors, including the novel "Cuckoo's Calling" by a mysterious Robert Galbraith that turned out to be J.K. Rowling. The remaining authors are as follows: Harlan Coben ("Deal Breaker", "Drop Shot", "Fade Away", "One False Move", "Gone for Good", "No Second Chance", "Tell No One"), C.S. Lewis ("The Last Battle", "Prince Caspian: The Return to Narnia", "The Silver Chair", "The Horse and His Boy", "The Lion, the Witch and the Wardrobe", "The Magician's Nephew", "The Voyage of the Dawn Treader"), J.K. Rowling ("The Casual Vacancy", "Harry Potter and the Chamber of Secrets", "Harry Potter and the Goblet of Fire", "Harry Potter and the Deathly Hallows", "Harry Potter and the Order of the Phoenix", "Harry Potter and the Half-Blood Prince", "Harry Potter and the Prisoner of Azkaban", "Harry Potter and the Philosopher's Stone"), and J.R.R. Tolkien ("The Fellowship of the Ring", "The Two Towers", "The Return of the King").

Usage

```
data("galbraith")
```

Details

The word frequencies are represented as a two-dimensional table: variables (words) in columns, samples (novels) in rows. The frequencies are relative, i.e. the number of occurrences of particular word type was divided by the total number of tokens in a given text.

Source

The novels represented by this dataset are protected by copyright. For that reason, it was not possible to provide the actual texts. Instead, the frequences of the most frequent words are obtained – and those can be freely distributed.

Examples

```
data(galbraith)
rownames(galbraith)

## Not run:
stylo(frequencies = galbraith, gui = FALSE)

## End(Not run)
```

`gui.classify` *GUI for the function classify*

Description

Graphical user interface for `classify`. Via the GUI, this function can set most of the variables needed for `classify`.

Usage

```
gui.classify(...)
```

Arguments

`...`	any variable as produced by `stylo.default.settings` can be set here to overwrite the default values.

Details

The function calls `stylo.default.settings` to initialize a number of default variables. Then it reads the file `classify_config.txt` (if the file exists and can be found in the current directory) to overwrite any default values. Then a GUI box appears, allowing the variables' customization by the user. Refer to HOWTO available at https://sites.google.com/site/computationalstylistics/ for a detailed explanation what the particular variables are for and how to use them.

Value

The function returns a list containing ca. 100 variables.

Author(s)

Jan Rybicki, Maciej Eder

See Also

`classify`, `gui.stylo`

Examples

```
## Not run:
gui.classify()

my.variables = gui.classify()
summary(my.variables)

## End(Not run)
```

gui.oppose *GUI for the function oppose*

Description

Graphical user interface for oppose. This function sets most of the variables needed for oppose.

Usage

```
gui.oppose(...)
```

Arguments

...	any variable as produced by stylo.default.settings can be set here to overwrite the default values.

Details

The function calls stylo.default.settings to initialize a number of default variables. Then it reads the file oppose_config.txt (if the file exists and can be found in the current directory) to overwrite any default values. Then a GUI box appears, allowing the variables' customization by the user. Refer to HOWTO available at https://sites.google.com/site/computationalstylistics/ for a detailed explanation what the particular variables are for and how to use them.

Value

The function returns a list containing ca. 100 variables.

Author(s)

Jan Rybicki, Maciej Eder

See Also

oppose, stylo.default.settings

Examples

```
## Not run:
gui.oppose()

my.variables = gui.oppose()
summary(my.variables)

## End(Not run)
```

`gui.stylo` *GUI for stylo*

Description

Graphical user interface for the function `stylo`. This function sets most of the variables needed for `stylo`.

Usage

```
gui.stylo(...)
```

Arguments

`...`	any variable as produced by `stylo.default.settings` can be set here to overwrite the default values.

Details

The function calls `stylo.default.settings` to initialize a number of default variables. Then it reads the file `stylo_config.txt` (if the file exists and can be found in the current directory) to overwrite any default values. Then a GUI box appears, allowing the variables' customization by the user. Refer to HOWTO available at https://sites.google.com/site/computationalstylistics/ for a detailed explanation what the particular variables are for and how to use them.

Value

The function returns a list containing ca. 100 variables.

Author(s)

Jan Rybicki, Maciej Eder

See Also

`stylo`, `stylo.default.settings`

Examples

```
## Not run:
gui.stylo()

my.variables = gui.stylo()
summary(my.variables)

## End(Not run)
```

`imposters` *Authorship Verification Classifier Known as the Imposters Method*

Description

A machine-learning supervised classifier tailored to assess authorship verification tasks. This function is an implementation of the 2nd order verification system known as the General Imposters framework (GI), and introduced by Koppel and Winter (2014). The current implementation tries to stick – with some improvements – to the description provided by Kestemont et al. (2016: 88). The function provides both the General Imposters imposters implementation, and its extended version known as the Bootstrap Distance Imposters as introduced by Nagy (2024).

Usage

```
imposters(reference.set,
          test = NULL,
          candidate.set = NULL,
          iterations = 100,
          features = 0.5,
          imposters = 0.5,
          method = "GI",
          classes.reference.set = NULL,
          classes.candidate.set = NULL,
          ...)
```

Arguments

`reference.set`	a table containing frequencies/counts for several variables – e.g. most frequent words – across a number of texts written by different authors. It is really important to put there a selection of "imposters", or the authors that could not have written the text to be assessed. If no `candidate.set` is used, then the table should also contain some texts written by possible candidates to authorship, or the authors that are suspected of being the actual author. Make sure that the rows contain samples, and the columns – variables (words, n-grams, or whatever needs to be analyzed).
`test`	a text to be checked for authorship, represented as a vector of, say, word frequencies. The variables used (i.e. columns) must match the columns of the reference set. If nothing is indicated, then the function will try to infer the test text from the `reference.set`; when worse comes to worst, the first text in the reference set will be excluded as the test text.
`candidate.set`	a table containing frequencies/counts for the candidate set. This set should contain texts written by possible candidates to authorship, or the authors that are suspected of being the actual author. The variables used (i.e. columns) must match the columns of the reference set. If no `candidate.set` is indicated, the function will test iteratively all the classes (one at a time) from the reference set.

`iterations` the model is rafined in N iterations. A reasonable number of turns is a few dozen or so (see the argument "features" below).

`features` a proportion of features to be analyzed. The imposters method selects randomly, in N iterations, a given subset of features (words, n-grams, etc.) and performs a classification. It is assumed that a large number of iteration, each involving a randomly selected subset of features, leads to a reliable coverage of features, among which some outliers might be hidden. The argument specifies the proportion of features to be randomly chosen; the indicated value should lay in the range between 0 and 1 (the default being 0.5).

`imposters` a proportion of text by the imposters to be analyzed. In each iteration, a specified number of texts from the comparison set is chosen (randomly). See above, for the features' choice. The default value of this parameter is 0.5.

`method` the default value "GI" makes the function perform the original General Imposters procedure, discussed by Kestemont et al. (2016). The option "BDI" switches to Bootstrap Distance Imposters method as introduced by Nagy (2024); rather than comparing a set of texts by a candidate against a set of texts by imposters, it randomly picks only one text by an impostor and one text by a candidate, and estimates the difference between their distances. Choosing the option "BDI" forces the above 'imposters' setting to take the value of 0.

`classes.reference.set`
a vector containing class identifiers for the reference set. When missing, the row names of the set table will be used; the assumed classes are the strings of characters followed by the first underscore. Consider the following examples: c("Sterne_Tristram", "Sterne_Sentimental", "Fielding_Tom", ...), where the classes are the authors' names, and c("M_Joyce_Dubliners", "F_Woolf_Night_and_day", "M_Conrad_Lord_Jim", ...), where the classes are M(ale) and F(emale) according to authors' gender. Note that only the part up to the first underscore in the sample's name will be included in the class label.

`classes.candidate.set`
a vector containing class identifiers for the candidate set. When missing, the row names of the set table will be used (see above).

`...` any other argument that can be passed to the classifier; see `perform.delta` for the parameters to be tweaked. In the current version of the function, only distance measure used for computing similarities between texts can be set. Available options so far: "delta" (Burrows's Delta, default), "argamon" (Argamon's Linear Delta), "eder" (Eder's Delta), "simple" (Eder's Simple Distance), "canberra" (Canberra Distance), "manhattan" (Manhattan Distance), "euclidean" (Euclidean Distance), "cosine" (Cosine Distance), "wurzburg" (Cosine Delta), "minmax" (Minmax Distance, also known as the Ruzicka measure).

Value

The function returns a single score indicating the probability that an anonymouns sample analyzed was/wasn't written by a candidate author. As a proportion, the score lies between 0 and 1 (higher scores indicate a higher attribution confidence). If more than one class is assessed, the resulting scores are returned as a vector.

Author(s)

Maciej Eder

References

Koppel, M. , and Winter, Y. (2014). Determining if two documents are written by the same author. "Journal of the Association for Information Science and Technology", 65(1): 178-187.

Kestemont, M., Stover, J., Koppel, M., Karsdorp, F. and Daelemans, W. (2016). Authenticating the writings of Julius Caesar. "Expert Systems With Applications", 63: 86-96.

Nagy, B. (2024). Bootstrap Distance Imposters. forthcoming.

See Also

perform.delta, imposters.optimize

Examples

```
## Not run:
# performing the imposters method on the dataset provided by the package:

# activating the datasets with "The Cuckoo's Calling", possibly written by JK Rowling
data(galbraith)

# running the imposters method against all the remaining authorial classes
imposters(galbraith)

# general usage:

# Let's assume there is a table with frequencies, the 12th row of which contains
# the data for a text one wants to verify. For the sake of simplicity, let's use
# the same `galbraith` dataset as above:
dataset = galbraith

# getting the 8th row from the dataset
text_to_be_tested = dataset[12,]

# building the reference set so that it does not contain the 12th row
remaining_frequencies = dataset[-c(12),]

# launching the imposters method:
imposters(reference.set = remaining_frequencies, test = text_to_be_tested)

## End(Not run)
```

`imposters.optimize` *Tuning Parameters for the Imposters Method*

Description

A function to optimize hyperparameters used in the General Imposters method (see `link{imposters}` for further details). Using a grid search approach, it tries to define a grey area where the attribution scores are not reliable.

Usage

```
imposters.optimize(reference.set,
                   classes.reference.set = NULL,
                   parameter.incr = 0.01,
                   ...)
```

Arguments

`reference.set`	a table containing frequencies/counts for several variables – e.g. most frequent words – across a number of texts written by different authors. Usually, it is a corpus of known authors (at least two tests per author) that is used to tune the optimal hyperparameters for the imposters method. Such a tuning involves a leave-one-out procedure of identifying a gray area when the results returned by the classifier are not particularly reliable. E.g., if one gets 0.39 and 0.55 as the parameters, one would assume that any results of the `imposters()` function that lay within this range should be claimed unreliable. Make sure that the rows contain samples, and the columns – variables (words, n-grams, or whatever needs to be analyzed).
`classes.reference.set`	a vector containing class identifiers for the reference set. When missing, the row names of the set table will be used; the assumed classes are the strings of characters followed by the first underscore. Consider the following example: c("Sterne_Tristram", "Sterne_Sentimental", "Fielding_Tom", ...), where the classes are the authors' names. Note that only the part up to the first underscore in the sample's name will be included in the class label.
`parameter.incr`	the procedure tries to optimize the hyperparameters via a grid search – this means that it tests the range of values between 0 and 1 incremented by a certain fraction. If this is set to 0.01 (default), it test 0, 0.01, 0.02, 0.03, ...
`...`	any other argument that can be passed to the classifier; see `perform.delta` for the parameters to be tweaked. In the current version of the function, only the distance measure used for computing similarities between texts can be set. Available options so far: "delta" (Burrows's Delta, default), "argamon" (Argamon's Linear Delta), "eder" (Eder's Delta), "simple" (Eder's Simple Distance), "canberra" (Canberra Distance), "manhattan" (Manhattan Distance), "euclidean" (Euclidean Distance), "cosine" (Cosine Distance), "wurzburg" (Cosine Delta), "minmax" (Minmax Distance, also known as the Ruzicka measure).

Value

The function returns two scores: the P1 and P2 values.

Author(s)

Maciej Eder

References

Koppel, M. , and Winter, Y. (2014). Determining if two documents are written by the same author. "Journal of the Association for Information Science and Technology", 65(1): 178-187.

Kestemont, M., Stover, J., Koppel, M., Karsdorp, F. and Daelemans, W. (2016). Authenticating the writings of Julius Caesar. "Expert Systems With Applications", 63: 86-96.

See Also

imposters

Examples

```
## Not run:
# activating a dummy dataset, in our case: Harper Lee and her Southern colleagues
data(lee)

# running the imposters method against all the remaining authorial classes
imposters.optimize(lee)

## End(Not run)
```

---

lee *Table of word frequencies (Lee, Capote, Faulkner, Styron, etc.)*

Description

This dataset contains a table (matrix) of relative frequencies of 3000 most frequent words retrieved from 28 books by 8 authors, including both novels by Harper Lee, namely "To Kill a Mockingbird" and "Go Set a Watchman". The remaining authors are as follows: Truman Capote ("In Cold Blood", "Breakfast at Tiffany's", "Summer Crossing", "The Grass Harp", "Other Voices, Other Rooms"), William Faulkner ("Absalom, Absalom!", "As I Lay Dying", "Light in August", "Go down, Moses", "The Sound and the Fury"), Ellen Glasgow ("Phases of an Inferior Planet", "Vein of Iron", "Virginia"), Carson McCullers ("The Heart is a Lonely Hunter", "The Member of the Wedding", "Reflections in a Golden Eye"), Flannery O'Connor ("Everything That Rises Must Converge", "The Compete Stories", "Wise Blood"), William Styron ("Sophie's Choice", "Set This House on Fire", "The Confessions of Nat Turner"), Eudora Welty ("Delta Wedding", "Losing Battles", "The Optimist's Dauther").

Usage

```
data("lee")
```

Details

The word frequencies are represented as a two-dimensional table: variables (words) in columns, samples (novels) in rows. The frequencies are relative, i.e. the number of occurrences of particular word type was divided by the total number of tokens in a given text.

Source

The novels represented by this dataset are protected by copyright. For that reason, it was not possible to provide the actual texts. Instead, the frequences of the most frequent words are obtained – and those can be freely distributed.

Examples

```
data(lee)
rownames(lee)

## Not run:
stylo(frequencies = lee, gui = FALSE)

## End(Not run)
```

---

load.corpus *Load text files*

Description

Function for loading text files from a specified directory.

Usage

```
load.corpus(files = "all", corpus.dir = "", encoding = "UTF-8")
```

Arguments

files	a vector of file names. The default value all is an equivalent to list.files().
corpus.dir	a directory containing the text files to be loaded; if not specified, the current working directory will be used.
encoding	useful if you use Windows and non-ASCII alphabets: French, Polish, Hebrew, etc. In such a situation, it is quite convenient to convert your text files into Unicode and to set this option to encoding = "UTF-8". In Linux and Mac, you are always expected to use Unicode, thus you don't need to set anything.

Value

The function returns an object of the class `stylo.corpus`. It is a list containing as elements the texts loaded.

Author(s)

Maciej Eder

See Also

`stylo`, `classify`, `rolling.classify`, `oppose`, `txt.to.words`

Examples

```
## Not run:
# to load file1.txt and file2.txt, stored in the subdirectory my.files:
my.corpus = load.corpus(corpus.dir = "my.files",
                        files = c("file1.txt", "file2.txt") )

# to load all XML files from the current directory:
my.corpus = load.corpus(files = list.files(pattern="[.]xml$") )

## End(Not run)
```

`load.corpus.and.parse` *Load text files and perform pre-processing*

Description

A high-level function that controls a number of other functions responsible for loading texts from files, deleting markup, sampling from texts, converting samples to n-grams, etc. It is build on top of a number of functions and thus it requires a large number of arguments. The only obligatory argument, however, is a vector containing the names of the files to be loaded.

Usage

```
load.corpus.and.parse(files = "all", corpus.dir = "", markup.type= "plain",
                      corpus.lang = "English", splitting.rule = NULL,
                      sample.size = 10000, sampling = "no.sampling",
                      sample.overlap = 0, number.of.samples = 1,
                      sampling.with.replacement = FALSE, features = "w",
                      ngram.size = 1, preserve.case = FALSE,
                      encoding = "UTF-8", ...)
```

Arguments

files	a vector of file names. The default value all is an equivalent to list.files().
corpus.dir	the directory containing the text files to be loaded; if not specified, the current directory will be used.
markup.type	choose one of the following values: plain (nothing will happen), html (all tags will be deleted as well as HTML header), xml (TEI header, any text between <note> </note> tags, and all the tags will be deleted), xml.drama (as above; additionally, speaker's names will be deleted, or strings within the <speaker> </speaker> tags), xml.notitles (as above; but, additionally, all the chapter/section (sub)titles will be deleted, or strings within each the <head> </head> tags); see delete.markup for further details.
corpus.lang	an optional argument indicating the language of the texts analyzed; the values that will affect the function's behavior are: English.contr, English.all, Latin.corr (type help(txt.to.words.ext) for explanation). The default value is English.
splitting.rule	if you are not satisfied with the default language settings (or your input string of characters is not a regular text, but a sequence of, say, dance movements represented using symbolic signs), you can indicate your custom splitting regular expression here. This option will overwrite the above language settings. For further details, refer to help(txt.to.words).
sample.size	desired size of samples, expressed in number of words; default value is 10,000.
sampling	one of three values: no.sampling (default), normal.sampling, random.sampling. See make.samples for explanation.
sample.overlap	if this opion is used, a reference text is segmented into consecutive, equal-sized samples that are allowed to partially overlap. If one specifies the sample.size parameter of 5,000 and the sample.overlap of 1,000, for example, the first sample of a text contains words 1–5,000, the second 4001–9,000, the third sample 8001–13,000, and so forth.
number.of.samples	optional argument which will be used only if random.sampling was chosen; it is self-evident.
sampling.with.replacement	optional argument which will be used only if random.sampling was chosen; it specifies the method used to randomly harvest words from texts.
features	an option for specifying the desired type of features: w for words, c for characters (default: w). See txt.to.features for further details.
ngram.size	an optional argument (integer) specifying the value of *n*, or the size of n-grams to be produced. If this argument is missing, the default value of 1 is used. See txt.to.features for further details.
preserve.case	whether ot not to lowercase all characters in the corpus (default = F).
encoding	useful if you use Windows and non-ASCII alphabets: French, Polish, Hebrew, etc. In such a situation, it is quite convenient to convert your text files into Unicode and to set this option to encoding = "UTF-8". In Linux and Mac, you are always expected to use Unicode, thus you don't need to set anything. In Windows, consider using UTF-8 but don't forget about the way of analyzing native ANSI encoded files: set this option to encoding = "native.enc".

... option not used; introduced here for compatibility reasons.

Value

The function returns an object of the class `stylo.corpus`. It is a list containing as elements the samples (entire texts or sampled subsets) split into words/characters and combined into n-grams (if applicable).

Author(s)

Maciej Eder

See Also

`load.corpus`, `delete.markup`, `txt.to.words`, `txt.to.words.ext`, `txt.to.features`, `make.samples`

Examples

```
## Not run:
# to load file1.txt and file2.txt, stored in the subdirectory my.files:
my.corpus = load.corpus.and.parse(files = c("file1.txt", "file2.txt"),
                        corpus.dir = "my.files")

# to load all XML files from the current directory, while getting rid of
# all markup tags in the file, and split the texts into consecutive
# word pairs (2-grams):
my.corpus = load.corpus.and.parse(files = list.files(pattern = "[.]xml$"),
                        markup.type = "xml", ngram.size = 2)

## End(Not run)
```

---

make.frequency.list *Make List of the Most Frequent Elements (e.g. Words)*

Description

Function for generating a frequency list of words or other (linguistic) features. It basically counts the elements of a vector and returns a vector of these elements in descending order of frequency.

Usage

```
make.frequency.list(data, value = FALSE, head = NULL, relative = TRUE)
```

Arguments

data	either a vector of elements (e.g. words, letter n-grams), or an object of a class stylo.corpus as produced by the function load.corpus.and.parse.
value	if this function is switched on, not only the most frequent elements are returned, but also their frequencies. Default: FALSE.
head	this option is meant to limit the number of the most frequent features to be returned. Default value is NULL, which means that the entire range of frequent and unfrequent features is returned.
relative	if you've switched on the option value (see above), you might want to convert your frequencies into relative frequencies, i.e. the counted occurrences divided by the length of the input vector – in a vast majority of cases you should use it, in order to neutralize different sample sizes. Default: TRUE.

Value

The function returns a vector of features (usually, words) in a descending order of their frequency. Alternatively, when the option value is set TRUE, it returns a vector of frequencies instead, and the features themselves might be accessed using the generic names function.

Author(s)

Maciej Eder

See Also

load.corpus.and.parse, make.table.of.frequencies

Examples

```
# assume there is a text:
text = "Mr. Sherlock Holmes, who was usually very late in the mornings,
       save upon those not infrequent occasions when he was up all night,
       was seated at the breakfast table. I stood upon the hearth-rug and
       picked up the stick which our visitor had left behind him the night
       before. It was a fine, thick piece of wood, bulbous-headed, of the
       sort which is known as a \"Penang lawyer.\""

# this text can be converted into vector of words:
words = txt.to.words(text)

# an avanced tokenizer is available via the function 'txt.to.words.ext':
words2 = txt.to.words.ext(text, corpus.lang = "English.all")

# a frequency list (just words):
make.frequency.list(words)
make.frequency.list(words2)

# a frequency list with the numeric values
make.frequency.list(words2, value = TRUE)
```

```
## Not run:
# ####################################
# using the function with large text collections

# first, load and pre-process a corpus from 3 text files:
dataset = load.corpus.and.parse(files = c("1.txt", "2.txt", "3.txt"))
#
# then, return 100 the most frequent words of the entire corpus:
make.frequency.list(dataset, head = 100)

## End(Not run)
```

`make.ngrams` *Make text n-grams*

Description

Function that combines a vector of text units (words, characters, POS-tags, other features) into pairs, triplets, or longer sequences, commonly referred to as n-grams.

Usage

```
make.ngrams(input.text, ngram.size = 1)
```

Arguments

`input.text`	a vector containing words or characters to be parsed into n-grams.
`ngram.size`	an optional argument (integer) indicating the value of *n*, or the size of n-grams to be produced. If this argument is missing, default value of 1 is used.

Details

Function for combining series of items (e.g. words or characters) into n-grams, or strings of *n* elements. E.g. character 2-grams of the sentence "This is a sentence" are as follows: "th", "hi", "is", "s ", " i", "is", "s ", " a", "a ", " s", "se", "en", "nt", "te", "en", "nc", "ce". Character 4-grams would be, of course: "this", "his ", "is a", "s a ", " a s", etc. Word 2-grams: "this is", "is a", "a sentence". The issue whether using n-grams of items increases the accuracy of stylometric procedures has been heavily debated in the secondary literature (see the reference section for further reading). Eder (2013) e.g. shows that character n-grams are suprisingly robust for dealing with noisy corpora (in terms of a high number of misspelled characters).

Author(s)

Maciej Eder

References

Alexis, A., Craig, H., and Elliot, J. (2014). Language chunking, data sparseness, and the value of a long marker list: explorations with word n-grams and authorial attribution. "Literary and Linguistic Computing", 29, advanced access (doi: 10.1093/llc/fqt028).

Eder, M. (2011). Style-markers in authorship attribution: a cross-language study of the authorial fingerprint. "Studies in Polish Linguistics", 6: 99-114. https://ejournals.eu/czasopismo/studies-in-polish-linguistics/numer/vol-6-issue-1.

Eder, M. (2013). Mind your corpus: systematic errors in authorship attribution. "Literary and Linguistic Computing", 28(4): 603-14.

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Koppel, M., Schler, J. and Argamon, S. (2009). Computational methods in authorship attribution. "Journal of the American Society for Information Science and Technology", 60(1): 9-26.

Stamatatos, E. (2009). A survey of modern authorship attribution methods. "Journal of the American Society for Information Science and Technology", 60(3): 538-56.

See Also

txt.to.words, txt.to.words.ext, txt.to.features

Examples

```
# Consider the string my.text:
my.text = "Quousque tandem abutere, Catilina, patientia nostra?"
# which can be split into a vector of consecutive words:
my.vector.of.words = txt.to.words(my.text)
# now, we create a vector of word 2-grams:
make.ngrams(my.vector.of.words, ngram.size = 2)

# similarly, you can produce character n-grams:
my.vector.of.chars = txt.to.features(my.vector.of.words, features = "c")
make.ngrams(my.vector.of.chars, ngram.size = 4)
```

---

make.samples *Split text to samples*

Description

Function that either splits an input text (a vector of linguistic items, such as words, word n-grams, character n-grams, etc.) into equal-sized samples of a desired length (expressed in words), or excerpts randomly a number of words from the original text.

Usage

```
make.samples(tokenized.text, sample.size = 10000,
             sampling = "no.sampling", sample.overlap = 0,
             number.of.samples = 1, sampling.with.replacement = FALSE)
```

Arguments

`tokenized.text`	input textual data stored either in a form of vector (single text), or as a list of vectors (whole corpus); particular vectors should contain tokenized data, i.e. words, word n-grams, or other features, as elements.
`sample.size`	desired size of sample expressed in number of words; default value is 10,000.
`sampling`	one of three values: `no.sampling` (default), `normal.sampling`, `random.sampling`.
`sample.overlap`	if this opion is used, a reference text is segmented into consecutive, equal-sized samples that are allowed to partially overlap. If one specifies the `sample.size` parameter of 5,000 and the `sample.overlap` of 1,000, for example, the first sample of a text contains words 1–5,000, the second 4001–9,000, the third sample 8001–13,000, and so forth.
`number.of.samples`	optional argument which will be used only if `random.sampling` was chosen; it is self-evident.
`sampling.with.replacement`	optional argument which will be used only if `random.sampling` was chosen; it specifies the method to randomly harvest words from texts.

Details

Normal sampling is probably a good choice when the input texts are long: the advantage is that one gets a bigger number of samples which, in a way, validate the results (when several independent samples excerpted from one text are clustered together). When the analyzed texts are significantly unequal in length, it is not a bad idea to prepare samples as randomly chosen "bags of words". For this, set the `sampling` variable to `random.sampling`. The desired size of the sample should be specified via the `sample.size` variable. Sampling with and without replacement is also available. It has been shown by Eder (2010) that harvesting random samples from original texts improves the performance of authorship attribution methods.

Author(s)

Mike Kestemont, Maciej Eder

References

Eder, M. (2015). Does size matter? Authorship attribution, small samples, big problem. "Digital Scholarship in the Humanities", 30(2): 167-182.

See Also

`txt.to.words`, `txt.to.words.ext`, `txt.to.features`, `make.ngrams`

Examples

```
my.text = "Arma virumque cano, Troiae qui primus ab oris
           Italiam fato profugus Laviniaque venit
           litora, multum ille et terris iactatus et alto
           vi superum, saevae memorem Iunonis ob iram,
           multa quoque et bello passus, dum conderet urbem
           inferretque deos Latio; genus unde Latinum
           Albanique patres atque altae moenia Romae.
           Musa, mihi causas memora, quo numine laeso
           quidve dolens regina deum tot volvere casus
           insignem pietate virum, tot adire labores
           impulerit. tantaene animis caelestibus irae?"
my.words = txt.to.words(my.text)

# split the above text into samples of 20 words:
make.samples(my.words, sampling = "normal.sampling", sample.size = 20)

# excerpt randomly 50 words from the above text:
make.samples(my.words, sampling = "random.sampling", sample.size = 50)

# excerpt 5 random samples from the above text:
make.samples(my.words, sampling = "random.sampling", sample.size = 50,
             number.of.samples = 5)
```

---

make.table.of.frequencies

Prepare a table of (relative) word frequencies

Description

Function that collects several frequency lists and combines them into a single frequency table. To this end a number of rearrangements inside particular lists are carried out. The table is produced using a reference list of words/features (passed as an argument).

Usage

```
make.table.of.frequencies(corpus, features, absent.sensitive = TRUE,
                          relative = TRUE)
```

Arguments

`corpus`	textual data: either a corpus (represented as a list), or a single text (represented as a vector); the data have to be split into words (or other features, such as character n-grams or word pairs).
`features`	a vector containing a reference feature list that will be used to build the table of frequencies (it is assumed that the reference list contains the same type of features as the `corpus` list, e.g. words, character n-grams, word pairs, etc.; otherwise, an empty table will be build).

`absent.sensitive`
: this optional argument is used to prevent building tables of words/features that never occur in the corpus. When switched on (default), variables containing 0 values across all samples, will be excluded. However, in some cases this is important to keep all the variables regardless of their values. This is e.g. the case when comparing two corpora: even if a given word did not occur in corpus A, it might be present in corpus B. In short: whenever you perform any analysis involving two or multiple sets of texts, switch this option to `FALSE`.

`relative`
: when this argument is switched to `TRUE` (default), relative frequencies are computed instead of raw frequencies.

Author(s)

Maciej Eder

See Also

`load.corpus`, `load.corpus.and.parse`

Examples

```
# to get frequencies of the words "a", "the" and "of" from a text:

sample.txt = txt.to.words("My father had a small estate
             in Nottinghamshire: I was the third of five sons.")
make.table.of.frequencies(sample.txt, c("a", "the", "of"))



# to get a table of frequencies across several texts:

txt.1 = "Gallia est omnis divisa in partes tres, quarum unam incolunt
    Belgae, aliam Aquitani, tertiam qui ipsorum lingua Celtae, nostra
    Galli appellantur."
txt.2 = "Si quis antea, iudices, mirabatur quid esset quod, pro tantis
    opibus rei publicae tantaque dignitate imperi, nequaquam satis multi
    cives forti et magno animo invenirentur qui auderent se et salutem
    suam in discrimen offerre pro statu civitatis et pro communi
    libertate, ex hoc tempore miretur potius si quem bonum et fortem
    civem viderit, quam si quem aut timidum aut sibi potius quam rei
    publicae consulentem."
txt.3 = "Nam mores et instituta vitae resque domesticas ac familiaris
    nos profecto et melius tuemur et lautius, rem vero publicam nostri
    maiores certe melioribus temperaverunt et institutis et legibus."
my.corpus.raw = list(txt.1, txt.2, txt.3)
my.corpus.clean = lapply(my.corpus.raw, txt.to.words)
my.favorite.words = c("et", "in", "se", "rara", "avis")
make.table.of.frequencies(my.corpus.clean, my.favorite.words)


# to include all words in the reference list, no matter if they
# occurred in the corpus:
```

```
make.table.of.frequencies(my.corpus.clean, my.favorite.words,
    absent.sensitive=FALSE)


# to prepare a table of frequencies of all the words represented in
# a corpus, in descendent occurence order, one needs to make the frequency
# list first, via the function 'make.frequency.list'
complete.word.list = make.frequency.list(my.corpus.clean)
make.table.of.frequencies(my.corpus.clean, complete.word.list)


# to create a table of frequencies of word pairs (word 2-grams):
my.word.pairs = lapply(my.corpus.clean, txt.to.features, ngram.size=2)
make.table.of.frequencies(my.word.pairs, c("et legibus", "hoc tempore"))
```

`novels` *A selection of 19th-century English novels*

Description

This dataset contains a selection of 9 novels in English, written by Jane Austen ("Emma", "Pride and Prejudice", "Sense and Sensibility"), Anne Bronte ("Agnes Grey", "The Tenant of Wildfell Hall"), Charlotte Bronte ("Jane Eyre", "The Professor", "Villette"), and Emily Bronte ("Wuthering Heights").

Usage

```
data("novels")
```

Details

The novels are represented as elements of a class `stylo.corpus`, i.e. a list containing particular texts as its elements. The texts are not tokenized.

Source

The texts are harvested from open-access resources, e.g. the Gutenberg Project.

Examples

```
data(novels)

print(novels)
summary(novels)
```

oppose *Contrastive analysis of texts*

Description

Function that performs a contrastive analysis between two given sets of texts. It generates a list of words significantly preferred by a tested author (or, a collection of authors), and another list containing the words significantly avoided by the former when compared to another set of texts. Some visualizations are available.

Usage

```
oppose(gui = TRUE, path = NULL,
         primary.corpus = NULL,
         secondary.corpus = NULL,
         test.corpus = NULL,
         primary.corpus.dir = "primary_set",
         secondary.corpus.dir = "secondary_set",
         test.corpus.dir = "test_set", ...)
```

Arguments

gui	an optional argument; if switched on, a simple yet effective graphical interface (GUI) will appear. Default value is TRUE.
path	if not specified, the current working directory will be used for input/output procedures (reading files, outputting the results, etc.).
primary.corpus.dir	the subdirectory (within the current working directory) that contains one or more texts to be compared to a comparison corpus. These texts can e.g. be the oeuvre by author A (to be compared to the oeuvre of another author B) or a collection of texts by female authors (to be contrasted with texts by male authors). If not specified, the default subdirectory primary_set will be used.
secondary.corpus.dir	the subdirectory (within the current working directory) that contains a comparison corpus: a pool of texts to be contrasted with texts from the primary.corpus. If not specified, the default subdirectory secondary_set will be used.
test.corpus.dir	the subdirectory (within the current working directory) that contains texts to verify the discriminatory strength of the features extracted from the primary.set and secondary.sets. Ideally, the test.corpus.dir should contain texts known to belong to both classes (e.g. texts written by female and male authors in the case of a gender-oriented study). If not specified, the default subdirectory test_set will be used. If the default subdirectory does not exist or does not contain any texts, the validation test will not be performed.

`primary.corpus` another option is to pass a pre-processed corpus as an argument (here: the primary set). It is assumed that this object is a list, each element of which is a vector containing one tokenized sample. Refer to `help(load.corpus.and.parse)` to get some hints how to prepare such a corpus.

`secondary.corpus` if `primary.corpus` is used, then you should also prepare a similar R object containing the secondary set.

`test.corpus` if you decide to use test corpus, you can pass it as a pre-processed R object using this argument.

`...` any variable produced by `stylo.default.settings` can be set here, in order to overwrite the default values.

Details

This function performs a contrastive analysis between two given sets of texts, using Burrows's Zeta (2007) in its different flavors, including Craig's extensions (Craig and Kinney, 2009). Also, the Whitney-Wilcoxon procedure as introduced by Kilgariff (2001) is available. The function generates a vector of words significantly preferred by a tested author, and another vector containing the words significantly avoided.

Value

The function returns an object of the class `stylo.results`: a list of variables, including a list of words significantly preferred in the primary set, words significantly avoided (or, preferred in the secondary set), and possibly some other results, if applicable.

Author(s)

Maciej Eder, Mike Kestemont

References

Eder, M., Rybicki, J. and Kestemont, M. (2016). Stylometry with R: a package for computational text analysis. "R Journal", 8(1): 107-21.

Burrows, J. F. (2007). All the way through: testing for authorship in different frequency strata. "Literary and Linguistic Computing", 22(1): 27-48.

Craig, H. and Kinney, A. F., eds. (2009). Shakespeare, Computers, and the Mystery of Authorship. Cambridge: Cambridge University Press.

Hoover, D. (2010). Teasing out authorship and style with t-tests and Zeta. In: "Digital Humanities 2010: Conference Abstracts". King's College London, pp. 168-170.

Kilgariff A. (2001). Comparing Corpora. "International Journal of Corpus Linguistics" 6(1): 1-37.

See Also

`stylo`, `classify`, `rolling.classify`

Examples

```
## Not run:
# standard usage:
oppose()

# batch mode, custom name of corpus directories:
oppose(gui = FALSE, primary.corpus.dir = "ShakespeareCanon",
       secondary.corpus.dir = "MarloweSamples")

## End(Not run)
```

`parse.corpus` *Perform pre-processing (tokenization, n-gram extracting, etc.)*

Description

A high-level function that controls a number of other functions responsible for dealing with a raw corpus stored as list, including deleting markup, sampling from texts, converting samples to n-grams, etc. It is build on top of a number of functions and thus it requires a large number of arguments. The only obligatory argument, however, is an R object containing a raw corpus: it is either an object of the class `sylo.corpus`, or a list of vectors, their elements being particular texts.

Usage

```
parse.corpus(input.data, markup.type = "plain",
                      corpus.lang = "English", splitting.rule = NULL,
                      sample.size = 10000, sampling = "no.sampling",
                      sample.overlap = 0, number.of.samples = 1,
                      sampling.with.replacement = FALSE, features = "w",
                      ngram.size = 1, preserve.case = FALSE,
                      encoding = "UTF-8")
```

Arguments

`input.data`	a list (preferably of the class `stylo.corpus`) containing a raw corpus, i.e. a vector of texts.
`markup.type`	choose one of the following values: `plain` (nothing will happen), `html` (all tags will be deleted as well as HTML header), `xml` (TEI header, any text between <note> </note> tags, and all the tags will be deleted), `xml.drama` (as above; additionally, speaker's names will be deleted, or strings within the <speaker> </speaker> tags), `xml.notitles` (as above; but, additionally, all the chapter/section (sub)titles will be deleted, or strings within each the <head> </head> tags); see `delete.markup` for further details.
`corpus.lang`	an optional argument indicating the language of the texts analyzed; the values that will affect the function's behavior are: `English.contr`, `English.all`, `Latin.corr` (type `help(txt.to.words.ext)` for explanation). The default value is `English`.

`splitting.rule` if you are not satisfied with the default language settings (or your input string of characters is not a regular text, but a sequence of, say, dance movements represented using symbolic signs), you can indicate your custom splitting regular expression here. This option will overwrite the above language settings. For further details, refer to `help(txt.to.words)`.

`sample.size` desired size of samples, expressed in number of words; default value is 10,000.

`sampling` one of three values: `no.sampling` (default), `normal.sampling`, `random.sampling`. See `make.samples` for explanation.

`sample.overlap` if this opion is used, a reference text is segmented into consecutive, equal-sized samples that are allowed to partially overlap. If one specifies the `sample.size` parameter of 5,000 and the `sample.overlap` of 1,000, for example, the first sample of a text contains words 1–5,000, the second 4001–9,000, the third sample 8001–13,000, and so forth.

`number.of.samples` optional argument which will be used only if `random.sampling` was chosen; it is self-evident.

`sampling.with.replacement` optional argument which will be used only if `random.sampling` was chosen; it specifies the method used to randomly harvest words from texts.

`features` an option for specifying the desired type of features: `w` for words, `c` for characters (default: `w`). See `txt.to.features` for further details.

`ngram.size` an optional argument (integer) specifying the value of *n*, or the size of n-grams to be produced. If this argument is missing, the default value of 1 is used. See `txt.to.features` for further details.

`preserve.case` whether ot not to lowercase all characters in the corpus (default = F).

`encoding` useful if you use Windows and non-ASCII alphabets: French, Polish, Hebrew, etc. In such a situation, it is quite convenient to convert your text files into Unicode and to set this option to `encoding = "UTF-8"`. In Linux and Mac, you are always expected to use Unicode, thus you don't need to set anything.

Value

The function returns an object of the class `stylo.corpus`. It is a list containing as elements the samples (entire texts or sampled subsets) split into words/characters and combined into n-grams (if applicable).

Author(s)

Maciej Eder

See Also

`load.corpus.and.parse`, `delete.markup`, `txt.to.words`, `txt.to.words.ext`, `txt.to.features`, `make.samples`

Examples

```
## Not run:
data(novels)
# depending on the size of the corpus, it might take a while:
parse.corpus(novels)

## End(Not run)
```

`parse.pos.tags` *Extract POS-tags or Words from Annotated Corpora*

Description

Function for extracting textual data from annotated corpora. It uderstands Stanford Tagger, TreeTagger TaKIPI (a tagger for Polish), and Alpino (a tagger for Dutch) output formats. Either part-of-speech tags, or words, or lemmata can be extracted.

Usage

```
parse.pos.tags(input.text, tagger = "stanford", feature = "pos")
```

Arguments

`input.text`	any string of characters (e.g. vector) containing markup tags that have to be deleted.
`tagger`	choose the input format: "stanford" for Stanford Tagger, "treetagger" for TreeTagger, "takipi" for TaKIPI.
`feature`	choose "pos" (default), "word", or "lemma" (this one is not available for the Stanford-formatted input).

Value

If the function is applied to a single text, then a vector of extracted features is returned. If it is applied to a corpus (a list, preferably of a class "stylo.corpus"), then a list of preprocessed texts are returned.

Author(s)

Maciej Eder

See Also

`load.corpus`, `txt.to.words`, `txt.to.words.ext`, `txt.to.features`

Examples

```
text = "I_PRP have_VBP just_RB returned_VBN from_IN a_DT visit_NN
  to_TO my_PRP$ landlord_NN -_: the_DT solitary_JJ neighbor_NN  that_IN
  I_PRP shall_MD be_VB troubled_VBN with_IN ._. This_DT is_VBZ certainly_RB
  a_DT beautiful_JJ country_NN !_. In_IN all_DT England_NNP ,_, I_PRP do_VBP
  not_RB believe_VB that_IN I_PRP could_MD have_VB fixed_VBN on_IN a_DT
  situation_NN so_RB completely_RB removed_VBN from_IN the_DT stir_VB of_IN
  society_NN ._."

parse.pos.tags(text, tagger = "stanford", feature = "word")
parse.pos.tags(text, tagger = "stanford", feature = "pos")
```

---

perform.culling *Exclude variables (e.g. words, n-grams) from a frequency table that are too characteristic for some samples*

Description

Culling refers to the automatic manipulation of the wordlist (proposed by Hoover 2004a, 2004b). The culling values specify the degree to which words that do not appear in all the texts of a corpus will be removed. A culling value of 20 indicates that words that appear in at least 20% of the texts in the corpus will be considered in the analysis. A culling setting of 0 means that no words will be removed; a culling setting of 100 means that only those words will be used in the analysis that appear in all texts of the corpus at least once.

Usage

```
perform.culling(input.table, culling.level = 0)
```

Arguments

`input.table`	a matrix or data frame containing frequencies of words or any other countable features; the table should be oriented to contain samples in rows, variables in columns, and variables' names should be accessible via `colnames(input.table)`.
`culling.level`	percentage of samples that need to have a given word in order to prevent this word from being culled (see the description above).

Author(s)

Maciej Eder

References

Hoover, D. (2004a). Testing Burrows's Delta. "Literary and Linguistic Computing", 19(4): 453-75.

Hoover, D. (2004b). Delta prime. "Literary and Linguistic Computing", 19(4): 477-95.

See Also

delete.stop.words, stylo.pronouns

Examples

```
# assume there is a matrix containing some frequencies
# (be aware that these counts are entirely fictional):
t1 = c(2, 1, 0, 2, 9, 1, 0, 0, 2, 0)
t2 = c(1, 0, 4, 2, 1, 0, 3, 0, 1, 3)
t3 = c(5, 2, 2, 0, 6, 0, 1, 0, 0, 0)
t4 = c(1, 4, 1, 0, 0, 0, 0, 3, 0, 1)
my.data.table = rbind(t1, t2, t3, t4)

# names of the samples:
rownames(my.data.table) = c("text1", "text2", "text3", "text4")
# names of the variables (e.g. words):
colnames(my.data.table) = c("the", "of", "in", "she", "me", "you",
                            "them", "if", "they", "he")
# the table looks as follows
print(my.data.table)

# selecting the words that appeared in at laest 50% of samples:
perform.culling(my.data.table, 50)
```

---

perform.delta *Distance-based classifier*

Description

Delta: a simple yet effective machine-learning method of supervised classification, introduced by Burrows (2002). It computes a table of distances between samples, and compares each sample from the test set against training samples, in order to find its nearest neighbor. Apart from classic Delta, a number of alternative distance measures are supported by this function.

Usage

```
perform.delta(training.set, test.set,
              classes.training.set = NULL,
              classes.test.set = NULL,
              distance = "delta", no.of.candidates = 3,
              z.scores.both.sets = TRUE)
```

Arguments

training.set	a table containing frequencies/counts for several variables – e.g. most frequent words – across a number of text samples (for the training set). Make sure that the rows contain samples, and the columns – variables (words, n-grams, or whatever needs to be analyzed).

`test.set` a table containing frequencies/counts for the training set. The variables used (i.e. columns) must match the columns of the training set.

`classes.training.set`
a vector containing class identifiers for the training set. When missing, the row names of the training set table will be used; the assumed classes are the strings of characters followed by the first underscore. Consider the following examples: c("Sterne_Tristram", "Sterne_Sentimental", "Fielding_Tom", ...), where the classes are the authors' names, and c("M_Joyce_Dubliners", "F_Woolf_Night_and_day", "M_Conrad_Lord_Jim", ...), where the classes are M(ale) and F(emale) according to authors' gender. Note that only the part up to the first underscore in the sample's name will be included in the class label.

`classes.test.set`
a vector containing class identifiers for the test set. When missing, the row names of the test set table will be used (see above).

`distance` a kernel (i.e. a distance measure) used for computing similarities between texts. Available options so far: "delta" (Burrow's Delta, default), "argamon" (Argamon's Linear Delta), "eder" (Eder's Delta), "simple" (Eder's Simple Distance), "canberra" (Canberra Distance), "manhattan" (Manhattan Distance), "euclidean" (Euclidean Distance), "cosine" (Cosine Distance).

`no.of.candidates`
how many nearest neighbors will be computed for each test sample (default = 3).

`z.scores.both.sets`
many distance measures convert input variables into z-scores before computing any distances. Such a variable weighting is highly dependent on the number of input texts. One might choose either training set only to scale the variables, or the entire corpus (both sets). The latter is default.

Value

The function returns a vector of "guessed" classes: each test sample is linked with one of the classes represented in the training set. Additionally, final scores and final rankings of candidates are returned as attributes.

Author(s)

Maciej Eder

References

Argamon, S. (2008). Interpreting Burrows's Delta: geometric and probabilistic foundations. "Literary and Linguistic Computing", 23(2): 131-47.

Burrows, J. F. (2002). "Delta": a measure of stylistic difference and a guide to likely authorship. "Literary and Linguistic Computing", 17(3): 267-87.

Jockers, M. L. and Witten, D. M. (2010). A comparative study of machine learning methods for authorship attribution. "Literary and Linguistic Computing", 25(2): 215-23.

See Also

perform.svm, perform.nsc, perform.knn, perform.naivebayes, dist.delta

Examples

```
## Not run:
perform.delta(training.set, test.set)

## End(Not run)

# classifying the standard 'iris' dataset:
data(iris)
x = subset(iris, select = -Species)
train = rbind(x[1:25,], x[51:75,], x[101:125,])
test = rbind(x[26:50,], x[76:100,], x[126:150,])
train.classes = c(rep("s",25), rep("c",25), rep("v",25))
test.classes = c(rep("s",25), rep("c",25), rep("v",25))

perform.delta(train, test, train.classes, test.classes)
```

---

perform.impostors *An Authorship Verification Classifier Known as the Impostors Method. ATTENTION: this function is obsolete; refer to a new implementation, aka the imposters() function!*

Description

A machine-learning supervised classifier tailored to assess authorship verification tasks. This function is an implementation of the 2nd order verification system known as the General Impostors framework (GI), and introduced by Koppel and Winter (2014). The current implementation tries to stick – as closely as possible – to the description provided by Kestemont et al. (2016: 88).

Usage

```
perform.impostors(candidate.set, impostors.set, iterations = 100,
                features = 50, impostors = 30,
                classes.candidate.set = NULL, classes.impostors.set = NULL,
                distance = "delta", z.scores.both.sets = TRUE)
```

Arguments

candidate.set	a table containing frequencies/counts for several variables – e.g. most frequent words – across a number of texts written by a target author (i.e. the candidate to authorship). This table should also contain an anonymous sample to be assessed. Make sure that the rows contain samples, and the columns – variables (words, n-grams, or whatever needs to be analyzed).

`impostors.set` a table containing frequencies/counts for the control set. This set should contain the samples by the impostors, or the authors that could not have written the anonymous sample in question. The variables used (i.e. columns) must match the columns of the candidate set.

`iterations` the model is rafined in N iterations. A reasonable number of turns is a few dozen or so (see the argument "features" below).

`features` the "impostors" method is sometimes referred to as a 2nd order authorship verification system, since it selects randomly, in N iterations, a given subset of features (words, n-grams, etc.) and performs a classification. This argument specifies the percentage of features to be randomly chosen; the default value is 50.

`impostors` in each iteration, a specified number of texts from the control set is chosen (randomly). The default number is 30.

`classes.candidate.set`
a vector containing class identifiers for the authorial set. When missing, the row names of the set table will be used; the assumed classes are the strings of characters followed by the first underscore. Consider the following examples: c("Sterne_Tristram", "Sterne_Sentimental", "Fielding_Tom", ...), where the classes are the authors' names, and c("M_Joyce_Dubliners", "F_Woolf_Night_and_day", "M_Conrad_Lord_Jim", ...), where the classes are M(ale) and F(emale) according to authors' gender. Note that only the part up to the first underscore in the sample's name will be included in the class label.

`classes.impostors.set`
a vector containing class identifiers for the control set. When missing, the row names of the set table will be used (see above).

`distance` a kernel (i.e. a distance measure) used for computing similarities between texts. Available options so far: "delta" (Burrow's Delta, default), "argamon" (Argamon's Linear Delta), "eder" (Eder's Delta), "simple" (Eder's Simple Distance), "canberra" (Canberra Distance), "manhattan" (Manhattan Distance), "euclidean" (Euclidean Distance), "cosine" (Cosine Distance). THIS OPTION WILL BE CHANGED IN NEXT VERSIONS.

`z.scores.both.sets`
many distance measures convert input variables into z-scores before computing any distances. Such a variable weighting is highly dependent on the number of input texts. One might choose either training set only to scale the variables, or the entire corpus (both sets). The latter is default. THIS OPTION WILL BE CHANGED (OR DELETED) IN NEXT VERSIONS.

Value

The function returns a single score indicating the probability that an anonymouns sample analyzed was/wasn't written by a candidate author. As a proportion, the score lies between 0 and 1 (higher scores indicate a higher attribution confidence).

Author(s)

Maciej Eder

References

Koppel, M. , and Winter, Y. (2014). Determining if two documents are written by the same author. "Journal of the Association for Information Science and Technology", 65(1): 178-187.

Kestemont, M., Stover, J., Koppel, M., Karsdorp, F. and Daelemans, W. (2016). Authenticating the writings of Julius Caesar. "Expert Systems With Applications", 63: 86-96.

See Also

imposters

`perform.knn` *k-Nearest Neighbor classifier*

Description

A machine-learning supervised classifier; this function is a wrapper for the k-NN procedure provided by the package `class`.

Usage

```
perform.knn(training.set, test.set, classes.training.set = NULL,
            classes.test.set = NULL, k.value = 1)
```

Arguments

`training.set`	a table containing frequencies/counts for several variables – e.g. most frequent words – across a number of text samples (for the training set). Make sure that the rows contain samples, and the columns – variables (words, n-grams, or whatever needs to be analyzed).
`test.set`	a table containing frequencies/counts for the training set. The variables used (i.e. columns) must match the columns of the training set.
`classes.training.set`	a vector containing class identifiers for the training set. When missing, the row names of the training set table will be used; the assumed classes are the strings of characters followed by the first underscore. Consider the following examples: c("Sterne_Tristram", "Sterne_Sentimental", "Fielding_Tom", ...), where the classes are the authors' names, and c("M_Joyce_Dubliners", "F_Woolf_Night_and_day", "M_Conrad_Lord_Jim", ...), where the classes are M(ale) and F(emale) according to authors' gender. Note that only the part up to the first underscore in the sample's name will be included in the class label.
`classes.test.set`	a vector containing class identifiers for the test set. When missing, the row names of the test set table will be used (see above).
`k.value`	number of nearest neighbors considered.

Value

The function returns a vector of "guessed" classes: each test sample is linked with one of the classes represented in the training set.

Author(s)

Maciej Eder

See Also

perform.svm, perform.nsc, perform.delta, perform.naivebayes

Examples

```
## Not run:
perform.knn(training.set, test.set)

## End(Not run)

# classifying the standard 'iris' dataset:
data(iris)
x = subset(iris, select = -Species)
train = rbind(x[1:25,], x[51:75,], x[101:125,])
test = rbind(x[26:50,], x[76:100,], x[126:150,])
train.classes = c(rep("s",25), rep("c",25), rep("v",25))
test.classes = c(rep("s",25), rep("c",25), rep("v",25))

perform.knn(train, test, train.classes, test.classes)
```

---

perform.naivebayes *Naive Bayes classifier*

Description

A machine-learning supervised classifier; this function is a wrapper for the Naive Bayes procedure provided by the package e1071.

Usage

```
perform.naivebayes(training.set, test.set,
        classes.training.set = NULL, classes.test.set = NULL)
```

Arguments

training.set	a table containing frequencies/counts for several variables – e.g. most frequent words – across a number of text samples (for the training set). Make sure that the rows contain samples, and the columns – variables (words, n-grams, or whatever needs to be analyzed).

`test.set` a table containing frequencies/counts for the training set. The variables used (i.e. columns) must match the columns of the training set.

`classes.training.set`
a vector containing class identifiers for the training set. When missing, the row names of the training set table will be used; the assumed classes are the strings of characters followed by the first underscore. Consider the following examples: c("Sterne_Tristram", "Sterne_Sentimental", "Fielding_Tom", ...), where the classes are the authors' names, and c("M_Joyce_Dubliners", "F_Woolf_Night_and_day", "M_Conrad_Lord_Jim", ...), where the classes are M(ale) and F(emale) according to authors' gender. Note that only the part up to the first underscore in the sample's name will be included in the class label.

`classes.test.set`
a vector containing class identifiers for the test set. When missing, the row names of the test set table will be used (see above).

Value

The function returns a vector of "guessed" classes: each test sample is linked with one of the classes represented in the training set.

Author(s)

Maciej Eder

See Also

`perform.svm`, `perform.nsc`, `perform.delta`, `perform.knn`

Examples

```
## Not run:
perform.naivebayes(training.set, test.set)

## End(Not run)

# classifying the standard 'iris' dataset:
data(iris)
x = subset(iris, select = -Species)
train = rbind(x[1:25,], x[51:75,], x[101:125,])
test = rbind(x[26:50,], x[76:100,], x[126:150,])
train.classes = c(rep("s",25), rep("c",25), rep("v",25))
test.classes = c(rep("s",25), rep("c",25), rep("v",25))

perform.naivebayes(train, test, train.classes, test.classes)
```

`perform.nsc` *Nearest Shrunken Centroids classifier*

Description

A machine-learning supervised classifier; this function is a wrapper for the Nearest Shrunken Centroids procedure provided by the package `pamr`.

Usage

```
perform.nsc(training.set,
              test.set,
              classes.training.set = NULL,
              classes.test.set = NULL,
              show.features = FALSE,
              no.of.candidates = 3)
```

Arguments

`training.set` a table containing frequencies/counts for several variables – e.g. most frequent words – across a number of text samples (for the training set). Make sure that the rows contain samples, and the columns – variables (words, n-grams, or whatever needs to be analyzed).

`test.set` a table containing frequencies/counts for the training set. The variables used (i.e. columns) must match the columns of the training set.

`classes.training.set`
a vector containing class identifiers for the training set. When missing, the row names of the training set table will be used; the assumed classes are the strings of characters followed by the first underscore. Consider the following examples: c("Sterne_Tristram", "Sterne_Sentimental", "Fielding_Tom", ...), where the classes are the authors' names, and c("M_Joyce_Dubliners", "F_Woolf_Night_and_day", "M_Conrad_Lord_Jim", ...), where the classes are M(ale) and F(emale) according to authors' gender. Note that only the part up to the first underscore in the sample's name will be included in the class label.

`classes.test.set`
a vector containing class identifiers for the test set. When missing, the row names of the test set table will be used (see above).

`show.features` a logical value (default: FALSE). When the option is switched on, the most discriminative features (e.g. words) will be shown.

`no.of.candidates`
how many nearest neighbors will be computed for each test sample (default = 3).

Value

The function returns a vector of "guessed" classes: each test sample is linked with one of the classes represented in the training set. Additionally, final scores and final rankings of candidates, as well as the discriminative features (if applicable) are returned as attributes.

Author(s)

Maciej Eder

See Also

perform.delta, perform.svm, perform.knn, perform.naivebayes

Examples

```
## Not run:
perform.nsc(training.set, test.set)

## End(Not run)

# classifying the standard 'iris' dataset:
data(iris)
x = subset(iris, select = -Species)
train = rbind(x[1:25,], x[51:75,], x[101:125,])
test = rbind(x[26:50,], x[76:100,], x[126:150,])
train.classes = c(rep("s",25), rep("c",25), rep("v",25))
test.classes = c(rep("s",25), rep("c",25), rep("v",25))

perform.nsc(train, test, train.classes, test.classes)
```

---

perform.svm *Support Vector Machines classifier*

Description

A machine-learning supervised classifier; this function is a wrapper for the Support Vector Machines procedure provided by the package e1071.

Usage

```
perform.svm(training.set,
            test.set,
            classes.training.set = NULL,
            classes.test.set = NULL,
            no.of.candidates = 3,
            tune.parameters = FALSE,
            svm.kernel = "linear",
            svm.degree = 3,
            svm.coef0 = 0,
            svm.cost = 1)
```

Arguments

`training.set`	a table containing frequencies/counts for several variables – e.g. most frequent words – across a number of text samples (for the training set). Make sure that the rows contain samples, and the columns – variables (words, n-grams, or whatever needs to be analyzed).
`test.set`	a table containing frequencies/counts for the training set. The variables used (i.e. columns) must match the columns of the training set.
`classes.training.set`	a vector containing class identifiers for the training set. When missing, the row names of the training set table will be used; the assumed classes are the strings of characters followed by the first underscore. Consider the following examples: c("Sterne_Tristram", "Sterne_Sentimental", "Fielding_Tom", ...), where the classes are the authors' names, and c("M_Joyce_Dubliners", "F_Woolf_Night_and_day", "M_Conrad_Lord_Jim", ...), where the classes are M(ale) and F(emale) according to authors' gender. Note that only the part up to the first underscore in the sample's name will be included in the class label.
`classes.test.set`	a vector containing class identifiers for the test set. When missing, the row names of the test set table will be used (see above).
`no.of.candidates`	how many nearest neighbors will be computed for each test sample (default = 3).
`tune.parameters`	if this argument is used, two parameters, namely gamma and cost, are tuned using a bootstrap procedure, and then used to build a SVM model.
`svm.kernel`	SVM kernel. Available values: "linear", which is probably the best choice in stylometry, since the number of variables (e.g. MFWs) is many times bigger than the number of classes; "polynomial", and "radial".
`svm.degree`	parameter needed for kernel of type "polynomial" (default: 3).
`svm.coef0`	parameter needed for kernel of type "polynomial" (default: 0).
`svm.cost`	cost of constraints violation (default: 1); it is the C-constant of the regularization term in the Lagrange formulation.

Value

The function returns a vector of "guessed" classes: each test sample is linked with one of the classes represented in the training set. Additionally, final scores and final rankings of candidates are returned as attributes.

Author(s)

Maciej Eder

See Also

`perform.delta`, `perform.nsc`, `perform.knn`, `perform.naivebayes`

Examples

```
## Not run:
perform.svm(training.set, test.set)

## End(Not run)

# classifying the standard 'iris' dataset:
data(iris)
x = subset(iris, select = -Species)
train = rbind(x[1:25,], x[51:75,], x[101:125,])
test = rbind(x[26:50,], x[76:100,], x[126:150,])
train.classes = c(rep("s",25), rep("c",25), rep("v",25))
test.classes = c(rep("s",25), rep("c",25), rep("v",25))

perform.svm(train, test, train.classes, test.classes)
```

---

performance.measures *Accuracy, Precision, Recall, and the F Measure*

Description

This function returns a few standard measurments used to test how efficient a given classifier is, in a supervised machine-learnig classification setup.

Usage

```
performance.measures(predicted_classes, expected_classes = NULL, f_beta = 1)
```

Arguments

predicted_classes	a vector of predictions outputted from a classifier. If an object containing results from `classify()`, `crossv`, `perform.delta`, `perform.svm` etc. is provided, then no further input data is required (see below).
expected_classes	a vector of expected classes, or the classification results that we knew in advance. This argument is immaterial when an object of the class `"stylo.results"` is provided. In such a case, only the above parameter `predicted_classes` is obligatory.
f_beta	the F score is usually used in its F1 version, but one can use any other scaling factor, e.g. F(1/2) or F(2); the default value is 1.

Value

The function returns a list containing four performance indexes – accuracy, precision, recall and the F measure – for each class, as well as an average score for all classes.

Author(s)

Maciej Eder

See Also

classify, perform.delta, perform.svm, perform.nsc

Examples

```
## Not run:
# classification results aka predictions (or, the classes "guessed" by a classifier)
what_we_got = c("prose", "prose", "prose", "poetry", "prose", "prose")
# expected classes (or, the ground truth)
what_we_expected = c("prose", "prose", "prose", "poetry", "poetry", "poetry")

performance.measures(what_we_got, what_we_expected)


# authorship attribution using the dataset 'lee'
#
data(lee)
results = crossv(training.set = lee, cv.mode = "leaveoneout",
                 classification.method = "delta")
performance.measures(results)


# classifying the standard 'iris' dataset:
#
data(iris)
x = subset(iris, select = -Species)
train = rbind(x[1:25,], x[51:75,], x[101:125,])
test = rbind(x[26:50,], x[76:100,], x[126:150,])
train.classes = c(rep("s",25), rep("c",25), rep("v",25))
test.classes = c(rep("s",25), rep("c",25), rep("v",25))
results = perform.delta(train, test, train.classes, test.classes)

performance.measures(results)


## End(Not run)
```

---

plot.sample.size *Plot Classification Accuracy for Short Text Samples*

Description

Plotting method for objects of the class "stylo.results", produced by the function samplesize.penalize. It can be used to show the behavior of short samples in text classification. See the help page of samplesize.penalize for further details.

Usage

```
## S3 method for class 'sample.size'
plot(x, target = NULL, variable = "diversity",
      trendline = TRUE, observations = FALSE,
      grayscale = FALSE, legend = TRUE,
      legend_pos = "bottomright", main = "default", ...)
```

Arguments

x	an object of class "stylo.results" as produced by the function samplesize.penalize.
target	the number of the text to be plotted, or its name as stored in the "stylo.results" object (see the examples below). Both ways are equivalent, where a numeric value represents the n-th text. If no target is specified, then the first text is plotted.
variable	choose either "accuracy" to get the classification accuracy, i.e. the ratio of correctly attributed instances to the number iterations (usually 100, see the help page of samplesize.penalize for further details), or "diversity" to get Simpson's index of class imbalance (this is the default value). The index provides you with the information how consistent was a classifier in its choices.
trendline	since all the observations represented in the plot might be difficult to read, one can use a trendline instead (default). The trendlines are produced using the generic lowess function.
observations	particular observations and a trendline (see above) can be combined. Switch this option on, to do so (default: FALSE).
grayscale	using this option, you can switch off colors.
legend	do you want to have the trendlines and/or observations explained? Switch this option on (which is default).
legend_pos	position of the legend: choose between "bottomright", "bottomleft", "topright" and "topleft".
main	title of the plot; use it as if it was a regular option of the function plot, or leave it as "default" to get the name of the sample as automatically extracted from the class "stylo.results".
...	further arguments to be passed to plot.

Details

An object generated by the samplesize.penalize function can be of course split into its parts and plotted using any other routine. The method discussed in this document is a simple shortcut: rather than refine your plot parameters from scratch, you can get acceptable results by using one single generic function plot; see a few examples below.

Author(s)

Maciej Eder

See Also

samplesize.penalize

Examples

```
## Not run:
# provided that there exists a text collection (text files)
# in the subdirectory 'corpus', perform a test for sample size:
results = samplesize.penalize(corpus.dir = "corpus")

# then plot the first text's classification accuracy:
plot(results)

# plot the results, e.g. for the 5th text:
plot(results, target = 5)

# the 'target' parameter can be set via the text's name,
# to see which texts are available in the results, type:
results$test.texts

# plot Simpson's diversity index for the text named 'Woolf_Years_1937':
plot(results_classic, target = "Woolf_Years_1937", variable = "diversity")


## End(Not run)
```

---

rolling.classify *Sequential machine-learning classification*

Description

Function that splits a text into equal-sized consecutive blocks (slices) and performs a supervised classification of these blocks against a training set. A number of machine-learning methods for classification used in computational stylistics are available: Delta, k-Nearest Neighbors, Support Vector Machines, Naive Bayes, and Nearest Shrunken Centroids.

Usage

```
rolling.classify(gui = FALSE, training.corpus.dir = "reference_set",
         test.corpus.dir = "test_set", training.frequencies = NULL,
         test.frequencies = NULL, training.corpus = NULL,
         test.corpus = NULL,  features = NULL, path = NULL,
         slice.size = 5000, slice.overlap = 4500,
         training.set.sampling = "no.sampling", mfw = 100, culling = 0,
         milestone.points = NULL, milestone.labels = NULL,
         plot.legend = TRUE, add.ticks = FALSE, shading = FALSE,
         ...)
```

Arguments

gui	an optional argument; if switched on, a simple yet effective graphical user interface (GUI) will appear. Default value is FALSE so far, since GUI is still under development.
training.frequencies	using this optional argument, one can load a custom table containing frequencies/counts for several variables, e.g. most frequent words, across a number of text samples (for the training set). It can be either an R object (matrix or data frame), or a filename containing tab-delimited data. If you use an R object, make sure that the rows contain samples, and the columns – variables (words). If you use an external file, the variables should go vertically (i.e. in rows): this is because files containing vertically-oriented tables are far more flexible and easily editable using, say, Excel or any text editor. To flip your table horizontally/vertically use the generic function t().
test.frequencies	using this optional argument, one can load a custom table containing frequencies/counts for the test set. Further details: immediately above.
training.corpus	another option is to pass a pre-processed corpus as an argument (here: the training set). It is assumed that this object is a list, each element of which is a vector containing one tokenized sample. The example shown below will give you some hints how to prepare such a corpus. Also, refer to help(load.corpus.and.parse)
test.corpus	if training.corpus is used, then you should also prepare a similar R object containing the test set.
features	usually, a number of the most frequent features (words, word n-grams, character n-grams) are extracted automatically from the corpus, and they are used as variables for further analysis. However, in some cases it makes sense to use a set of tailored features, e.g. the words that are associated with emotions or, say, a specific subset of function words. This optional argument allows to pass either a filename containing your custom list of features, or a vector (R object) of features to be assessed.
path	if not specified, the current directory will be used for input/output procedures (reading files, outputting the results).
training.corpus.dir	the subdirectory (within the current working directory) that contains the training set, or the collection of texts used to exemplify the differences between particular classes (e.g. authors or genres). The discriminating features extracted from this training material will be used during the testing procedure (see below). If not specified, the default subdirectory reference_set will be used.
test.corpus.dir	the subdirectory (within the working directory) that contains a test to be assessed, long enough to be split automatically into equal-sized slices, or blocks. If not specified, the default subdirectory test_set will be used.
slice.size	a text to be analyzed is segmented into consecutive, equal-sized samples (slices, windows, or blocks); the slice size is set using this parameter: default is 5,000 words. The samples are allowed to partially overlap (see the next parameter).

`slice.overlap` if one specifies a `slice.size` of 5,000 and a `slice.overlap` of 4,500 (which is default), then the first extracted sample contains words 1–5,000, the second 501–5,500, the third sample 1001–6,000, and so forth.

`training.set.sampling`
sometimes, it makes sense to split training set texts into smaller samples. Available options: "no.sampling" (default), "normal.sampling", "random.sampling". See `help(make.samples)` for further details.

`mfw` number of the most frequent words (MFWs) to be analyzed.

`culling` culling level; see `help(perform.culling)` to get some help on the culling procedure principles.

`milestone.points`
sometimes, there is a need to mark one or more passages in an analyzed text (e.g. when external evidence suggests an authorial takeover at a certain point) to compare if the a priori knowledge is confirmed by stylometric evidence. To this end, one should add into the test file a string "xmilestone" (when input texts are loaded directly from files), or specify the break points using this parameter. E.g., to add two lines at 10,000 words and 15,000 words, use `milestone.points = c(10000, 15000)`.

`milestone.labels`
when milestone points are used (see immediately above), they are automatically labelled using lowercase letters: "a", "b", "c" etc. However, one can replace them with custom labels, e.g. `milestone.labels = c("Act I", "Act II")`.

`plot.legend` self-evident. Default: `TRUE`.

`add.ticks` a graphical parameter: consider adding tiny ticks (short horizontal lines) to see the density of sampling. Default: `FALSE`.

`shading` instead of using colors on the final plot, one might choose to use shading hatches, which might be an option to toggle with greyscale, but also with non-black settings thereby allowing for photocopier-friendly charts (even if they may be subjectively unattractive). To use this option, switch it to `TRUE`.

`...` any variable as produced by `stylo.default.settings()` can be set here to overwrite the default values.

Details

There are numerous additional options that are passed to this function; so far, they are all loaded when `stylo.default.settings()` is executed (it will be invoked automatically from inside this function); the user can set/change them in the GUI.

Value

The function returns an object of the class `stylo.results`: a list of variables, including tables of word frequencies, vector of features used, a distance table and some more stuff. Additionally, depending on which options have been chosen, the function produces a number of files used to save the results, features assessed, generated tables of distances, etc.

Author(s)

Maciej Eder

References

Eder, M. (2015). Rolling stylometry. "Digital Scholarship in the Humanities", 31(3): 457-69.

Eder, M. (2014). Testing rolling stylometry. https://goo.gl/f0YlOR.

See Also

classify, rolling.delta

Examples

```
## Not run:
# standard usage (it builds a corpus from a collection of text files):
rolling.classify()

rolling.classify(training.frequencies = "freqs_train.txt",
    test.frequencies = "freqs_test.txt", write.png.file = TRUE,
    classification.method = "nsc")

## End(Not run)
```

---

rolling.delta *Sequential stylometric analysis*

Description

Function that analyses collaborative works and tries to determine the authorship of their fragments.

Usage

```
rolling.delta(gui = TRUE, path = NULL, primary.corpus.dir = "primary_set",
              secondary.corpus.dir = "secondary_set")
```

Arguments

gui	an optional argument; if switched on, a simple yet effective graphical user interface (GUI) will appear. Default value is TRUE.
path	if not specified, the current working directory will be used for input/output procedures (reading files, outputting the results).
primary.corpus.dir	the subdirectory (within the current working directory) that contains a collection of texts written by the authorial candidates, likely to have been involved in the collaborative work analyzed. If not specified, the default subdirectory primary_set will be used.
secondary.corpus.dir	the subdirectory (within the current working directory) that contains the collaborative work to be analyzed. If not specified, the default subdirectory secondary_set will be used.

Details

The procedure provided by this function analyses collaborative works and tries to determine the authorship of their fragments. The first step involves a "windowing" procedure (Dalen-Oskam and Zundert, 2007) in which each reference text is segmented into consecutive, equal-sized samples or windows. After "rolling" through the test text, we can plot the resulting series of Delta scores for each reference text in a graph.

Value

The function returns an object of the class `stylo.results`, and produces a final plot.

Author(s)

Mike Kestemont, Maciej Eder, Jan Rybicki

References

Eder, M., Rybicki, J. and Kestemont, M. (2016). Stylometry with R: a package for computational text analysis. "R Journal", 8(1): 107-21.

van Dalen-Oskam, K. and van Zundert, J. (2007). Delta for Middle Dutch: author and copyist distinction in Walewein. "Literary and Linguistic Computing", 22(3): 345-62.

Hoover, D. (2011). The Tutor's Story: a case study of mixed authorship. In: "Digital Humanities 2011: Conference Abstracts". Stanford University, Stanford, CA, pp. 149-51.

Rybicki, J., Kestemont, M. and Hoover D. (2014). Collaborative authorship: Conrad, Ford and rolling delta. "Literary and Linguistic Computing", 29(3): 422-31.

Eder, M. (2015). Rolling stylometry. "Digital Scholarship in the Humanities", 31(3): 457-69.

See Also

`rolling.classify`, `stylo`

Examples

```
## Not run:
# standard usage:
rolling.delta()

# batch mode, custom name of corpus directories:
rolling.delta(gui = FALSE, primary.corpus.dir = "MySamples",
       secondary.corpus.dir = "ReferenceCorpus")

## End(Not run)
```

`samplesize.penalize` *Determining Minimal Sample Size for Text Classification*

Description

This function tests the ability of a given input text (or texts) to be correctly classified in a supervised machine-learning setup (e.g. Delta, SVM or NSC) when its length is limited. The procedure, introduced by Eder (2017), involves several iterations in which longer and longer samples are drawn from the text in question, and then they are tested against a training set. For very short samples, the obtained classification accuracy is quite low (obviously), but then it usually increases until it finally reaches a point of saturation. The function `samplesize.penalize` is aimed at indentifying such a saturation point.

Usage

```
samplesize.penalize(training.frequencies = NULL,
              test.frequencies = NULL,
              training.corpus = NULL, test.corpus = NULL,
              mfw = c(100, 200, 500), features = NULL,
              path = NULL, corpus.dir = "corpus",
              sample.size.coverage = seq(100, 10000, 100),
              sample.with.replacement = FALSE,
              iterations = 100, classification.method = "delta",
              list.cutoff = 1000, ...)
```

Arguments

`training.frequencies`
: using this optional argument, one can load a custom table containing frequencies/counts for several variables, e.g. most frequent words, across a number of text samples (for the training set). It can be either an R object (matrix or data frame), or a filename containing tab-delimited data. If you use an R object, make sure that the rows contain samples, and the columns – variables (words). If you use an external file, the variables should go vertically (i.e. in rows): this is because files containing vertically-oriented tables are far more flexible and easily editable using, say, Excel or any text editor. To flip your table horizontally/vertically use the generic function `t()`.

`test.frequencies`
: using this optional argument, one can load a custom table containing frequencies/counts for the test set. Further details: immediately above.

`training.corpus`
: another option is to pass a pre-processed corpus as an argument (here: the training set). It is assumed that this object is a list, each element of which is a vector containing one tokenized sample. The example shown below will give you some hints how to prepare such a corpus. Also, refer to `help(load.corpus.and.parse)`

`test.corpus`
: if `training.corpus` is used, then you should also prepare a similar R object containing the test set.

`mfw` how many most frequent words (or other units) should be used as features to test the classifier? The default value is `c(100,200,500)`, to assess three different ranges of MFWs.

`features` usually, a number of the most frequent features (words, word n-grams, character n-grams) are extracted automatically from the corpus, and they are used as variables for further analysis. However, in some cases it makes sense to use a set of tailored features, e.g. the words that are associated with emotions or, say, a specific subset of function words. This optional argument allows to pass either a filename containing your custom list of features, or a vector (R object) of features to be assessed.

`path` if not specified, the current directory will be used for input/output procedures (reading files, outputting the results).

`corpus.dir` the subdirectory (within the current working directory) that contains the corpus text files. If not specified, the default subdirectory `corpus` will be used. This option is immaterial when an external corpus and/or external tables with frequencies are loaded.

`sample.size.coverage`
the procedure iteratively tests classification accuracy for different sample sizes. Feel free to modify the default value `c(100, 10000, 100)`, which tests samples for 100, 200, 300, ..., 10,000 words.

`sample.with.replacement`
if a tested sample size is bigger than the text to be tested, then the procedure stops, obviously. To prevent such a situation, you might decide to draw your samples (n words) with replacement, which means that particular words can be picked more than once (default value is `FALSE`).

`iterations` each sample size of a given text is tested by extracting randomly n words from the text in N iterations (default being 100). Since the procedure is random, a large(ish) number of iterations, say 100, allows for testing an actual behavior of a given sample size.

`classification.method`
the option invokes one of the classification methods provided by the package `stylo`. Choose one of the following: "delta", "svm", "knn", "nsc", "naivebayes".

`list.cutoff` when texts are loaded from files, tokenized, and counted, it is all followed by building a table of frequencies. Since it is unlikely to analyze thousands of most frequent words (rather than 100 or, say, 500), it saves lots of time when the table of frequencies is trimmed. The default value is 1000 most frequent words.

`...` any other argument, usually tokenization settings (via the parameters `corpus.lang`, `features`, `ngram.size` etc.), or hyperparameters of different classification methods, such as a distanse measure (for Delta), a cost function (for SVM), and so forth.

Details

If no additional argument is passed, then the function tries to load text files from the default subdirectory `corpus`. The resulting object will then contain accuracy and diversity scores for all the texts.

Value

The function returns an object of the class `stylo.results`: a list of variables, including classification accuracy scores for each tested text and each assessed sample size, Simpson's diversity index scores, and the names of the texts analyzed. Use the generic function `summary` to see the contents of the object. Use the generic function `plot` to generate a tailored plot conveniently.

Author(s)

Maciej Eder

References

Eder, M. (2017). Short samples in authorship attribution: A new approach. "Digital Humanities 2017: Conference Abstracts". Montreal: McGill University, pp. 221–24, https://dh2017.adho.org/abstracts/341/341.pdf.

See Also

`plot.sample.size`, `classify`, `imposters`

Examples

```
## Not run:

# standard usage (it builds a corpus from a set of text files):
results = samplesize.penalize()
plot(results)


## End(Not run)
```

`stylo` *Stylometric multidimensional analyses*

Description

It is quite a long story what this function does. Basically, it is an all-in-one tool for a variety of experiments in computational stylistics. For a more detailed description, refer to HOWTO available at: https://sites.google.com/site/computationalstylistics/

Usage

```
stylo(gui = TRUE, frequencies = NULL, parsed.corpus = NULL,
      features = NULL, path = NULL, metadata = NULL,
      filename.column = "filename", grouping.column = "author",
      corpus.dir = "corpus", ...)
```

Arguments

gui	an optional argument; if switched on, a simple yet effective graphical interface (GUI) will appear. Default value is TRUE.
frequencies	using this optional argument, one can load a custom table containing frequencies/counts for several variables, e.g. most frequent words, across a number of text samples. It can be either an R object (matrix or data frame), or a filename containing tab-delimited data. If you use an R object, make sure that the rows contain samples, and the columns – variables (words). If you use an external file, the variables should go vertically (i.e. in rows): this is because files containing vertically-oriented tables are far more flexible and easily editable using, say, Excel or any text editor. To flip your table horizontally/vertically use the generic function t().
parsed.corpus	another option is to pass a pre-processed corpus as an argument. It is assumed that this object is a list, each element of which is a vector containing one tokenized sample. The example shown below will give you some hints how to prepare such a corpus.
features	usually, a number of the most frequent features (words, word n-grams, character n-grams) are extracted automatically from the corpus, and they are used as variables for further analysis. However, in some cases it makes sense to use a set of tailored features, e.g. the words that are associated with emotions or, say, a specific subset of function words. This optional argument allows to pass either a filename containing your custom list of features, or a vector (R object) of features to be assessed.
path	if not specified, the current directory will be used for input/output procedures (reading files, outputting the results).
corpus.dir	the subdirectory (within the current working directory) that contains the corpus text files. If not specified, the default subdirectory corpus will be used. This option is immaterial when an external corpus and/or external table with frequencies is loaded.
metadata	if not specified, colors for plotting will be assigned accoding to file names after the usual author_ducument.txt pattern. But users can also specify a grouping variable, i.e. a vector of a length equal to the number of texts in the corpus, or a csv file, conventionally named "metadata.csv" containg matadata for the corpus. This metadata file should contain one row per document, a column with the file names in alphabetical order, and a calumn containing the grouping varible.
filename.column	the column in the metadata.csv containg the file names of the documents in alphabetical order.
grouping.column	the column in the metadata.csv containg the grouping variable.
...	any variable produced by stylo.default.settings can be set here, in order to overwrite the default values. An example of such a variable is network = TRUE (switched off as default) for producing stylometric bootstrap consensus networks (Eder, forthcoming); the function saves a csv file, containing a list of nodes that can be loaded into, say, Gephi.

Details

If no additional argument is passed, then the function tries to load text files from the default subdirectory `corpus`. There are a lot of additional options that should be passed to this function; they are all loaded when `stylo.default.settings` is executed (which is typically called automatically from inside the `stylo` function).

Value

The function returns an object of the class `stylo.results`: a list of variables, including a table of word frequencies, vector of features used, a distance table and some more stuff. Additionally, depending on which options have been chosen, the function produces a number of files containing results, plots, tables of distances, etc.

Author(s)

Maciej Eder, Jan Rybicki, Mike Kestemont, Steffen Pielström

References

Eder, M., Rybicki, J. and Kestemont, M. (2016). Stylometry with R: a package for computational text analysis. "R Journal", 8(1): 107-21.

Eder, M. (2017). Visualization in stylometry: cluster analysis using networks. "Digital Scholarship in the Humanities", 32(1): 50-64.

See Also

`classify`, `oppose`, `rolling.classify`

Examples

```
## Not run:
# standard usage (it builds a corpus from a set of text files):
stylo()

# loading word frequencies from a tab-delimited file:
stylo(frequencies = "my_frequencies.txt")

# using an existing corpus (a list containing tokenized texts):
txt1 = c("to", "be", "or", "not", "to", "be")
txt2 = c("now", "i", "am", "alone", "o", "what", "a", "slave", "am", "i")
txt3 = c("though", "this", "be", "madness", "yet", "there", "is", "method")
custom.txt.collection = list(txt1, txt2, txt3)
  names(custom.txt.collection) = c("hamlet_A", "hamlet_B", "polonius_A")
stylo(parsed.corpus = custom.txt.collection)

# using a custom set of features (words, n-grams) to be analyzed:
my.selection.of.function.words = c("the", "and", "of", "in", "if", "into",
                                   "within", "on", "upon", "since")
stylo(features = my.selection.of.function.words)
```

```
# loading a custom set of features (words, n-grams) from a file:
stylo(features = "wordlist.txt")

# batch mode, custom name of corpus directory:
my.test = stylo(gui = FALSE, corpus.dir = "ShakespeareCanon")
summary(my.test)

# batch mode, character 3-grams requested:
stylo(gui = FALSE, analyzed.features = "c", ngram.size = 3)


## End(Not run)
```

`stylo.default.settings`

Setting variables for the package stylo

Description

Function that sets a series of global variables to be used by the package `stylo` and which can be modified by users via arguments passed to the function and/or via `gui.stylo`, `gui.classify`, or `gui.oppose`.

Usage

```
stylo.default.settings(...)
```

Arguments

`...`	any variable as produced by this function can be set here to overwrite the default values.

Details

This function is typically called from inside `stylo`, `classify`, `oppose`, `gui.stylo`, `gui.classify` and `gui.oppose`.

Value

The function returns a list of a few dozen variables, mostly options and parameters for different stylometric tests.

Author(s)

Maciej Eder, Jan Rybicki, Mike Kestemont

See Also

`stylo`, `gui.stylo`

Examples

```
stylo.default.settings()

# to see which variables have been set:
names(stylo.default.settings())

# to use the elements of the list as if they were independent variables:
my.variables = stylo.default.settings()
attach(my.variables)
```

`stylo.network` *Bootstrap consensus networks, with D3 visualization*

Description

A function to perform Bootstrap Consensus Network analysys (Eder, 2017), supplemented by interactive visualization (this involves javascript D3). This is a variant of the function `stylo`, except that it produces final networks without any external software (e.g. Gephi). To use this function, one is required to install the package `networkD3`.

Usage

```
stylo.network(mfw.min = 100, mfw.max = 1000, ...)
```

Arguments

`mfw.min`	the minimal MFW value (e.g. 100 most frequent words) to start the bootstrap procedure with.
`mfw.max`	the maximum MFW value (e.g. 1000 most frequent words), where procedure should stop. It is required that at least three iterations are completed.
`...`	any variable produced by `stylo.default.settings` can be set here, in order to overwrite the default values. An example of such a variable is `network = TRUE` (switched off as default) for producing stylometric bootstrap consensus networks (Eder, forthcoming); the function saves a csv file, containing a list of nodes that can be loaded into, say, Gephi.

Details

The Bootstrap Consensus Network method computes nearest neighborship relations between texts, and then tries to represent them in a form of a network (Eder, 2017). Since multidimensional methods are sensitive to input features (e.g. most frequent words), the methdod produces a series of networks for different MFW settings, and then combines them into a consensus network. To do so, it assumes that both the mininum MFW value and the maximum value is provided. If no additional argument is passed, then the function tries to load text files from the default subdirectory `corpus`. There are a lot of additional options that should be passed to this function; they are all loaded when `stylo.default.settings` is executed (which is typically called automatically from inside the `stylo` function).

Value

The function returns an object of the class `stylo.results`: a list of variables, including a table of word frequencies, vector of features used, a distance table and some more stuff. Additionally, depending on which options have been chosen, the function produces a number of files containing results, plots, tables of distances, etc.

Author(s)

Maciej Eder

References

Eder, M. (2017). Visualization in stylometry: cluster analysis using networks. "Digital Scholarship in the Humanities", 32(1): 50-64.

See Also

stylo

Examples

```
## Not run:
# standard usage (it builds a corpus from a set of text files):
stylo.networks()

# to take advantage of a dataset provided by the library 'stylo',
# in this case, a selection of Amarican literature from the South
data(lee)
help(lee) # to see what this dataset actually contains
#
stylo.network(frequencies = lee)

## End(Not run)
```

---

stylo.pronouns *List of pronouns*

Description

This function returns a list of pronouns that can be used as a stop word list for different stylometric analyses. It has been shown that pronoun deletion improves, to some extent, attribution accuracy of stylometric procedures (e.g. in English novels: Hoover 2004a; 2004b).

Usage

```
stylo.pronouns(corpus.lang = "English")
```

Arguments

corpus.lang	an optional argument specifying the language of the texts analyzed: available languages are English, Latin, Polish, Dutch, French, German, Spanish, Italian, and Hungarian (default is English).

Value

The function returns a vector of pronouns.

Author(s)

Jan Rybicki, Maciej Eder, Mike Kestemont

References

Hoover, D. (2004a). Testing Burrows's delta. "Literary and Linguistic Computing", 19(4): 453-75.

Hoover, D. (2004b). Delta prime?. "Literary and Linguistic Computing", 19(4): 477-95.

See Also

stylo

Examples

```
stylo.pronouns()
stylo.pronouns(corpus.lang = "Latin")
my.stop.words = stylo.pronouns(corpus.lang = "German")
```

---

txt.to.features *Split string of words or other countable features*

Description

Function that converts a vector of words into either words, or characters, and optionally parses them into n-grams.

Usage

```
txt.to.features(tokenized.text, features = "w", ngram.size = 1)
```

Arguments

tokenized.text	a vector of tokinzed words
features	an option for specifying the desired type of feature: w for words, c for characters (default: w).
ngram.size	an optional argument (integer) indicating the value of *n*, or the size of n-grams to be created. If this argument is missing, the default value of 1 is used.

Details

Function that carries out the preprocessing steps necessary for feature selection: converts an input text into the type of sequences needed (n-grams etc.) and returns a new vector of items. The function invokes `make.ngrams` to combine single units into pairs, triplets or longer n-grams. See `help(make.ngrams)` for details.

Author(s)

Maciej Eder, Mike Kestemont

See Also

`txt.to.words`, `txt.to.words.ext`, `make.ngrams`

Examples

```
# consider the string my.text:
my.text = "Quousque tandem abutere, Catilina, patientia nostra?"

# split it into a vector of consecutive words:
my.vector.of.words = txt.to.words(my.text)

# build a vector of word 2-grams:
txt.to.features(my.vector.of.words, ngram.size = 2)

# or produce character n-grams (in this case, character tetragrams):
txt.to.features(my.vector.of.words, features = "c", ngram.size = 4)
```

`txt.to.words` *Split text into words*

Description

Generic tokenization function for splitting a given input text into single words (chains of characters delimited by spaces or punctuation marks).

Usage

```
txt.to.words(input.text, splitting.rule = NULL, preserve.case = FALSE)
```

Arguments

`input.text`	a string of characters, usually a text.
`splitting.rule`	an optional argument indicating an alternative splitting regexp. E.g., if your corpus contains no punctuation, you can use a very simple splitting sequence: `"[ \t\n]+"` or `"[[:space:]]+"` (in this case, any whitespace is assumed to be a word delimiter). If you deal with non-latin scripts, especially with those that are not supported by the `stylo` package yet (e.g. Chinese, Japanese, Vietnamese,

Georgian), you can indicate your letter characters explicitly: for most Cyrillic scripts try the following code `"[^\u0400-\u0482\u048A\u04FF]+"`. Remember, however, that your texts need to be properly loaded into R (which is quite tricky on Windows; see below).

`preserve.case` Whether or not to lowercase all characters in the corpus (default is `FALSE`).

Details

The generic tokenization function for splitting a given input text into single words (chains of characters delimited with spaces or punctuation marks). In obsolete versions of the package `stylo`, the default splitting sequence of chars was `"[^[:alpha:]]+"` on Mac/Linux, and `"\\W+_"` on Windows. Two different splitting rules were used, because regular expressions are not entirely platform-independent; type `help(regexp)` for more details. For the sake of compatibility, then, in the version >=0.5.6 a lengthy list of dozens of letters in a few alphabets (Latin, Cyrillic, Greek, Hebrew, Arabic so far) has been indicated explicitly:

```
paste("[^A-Za-z",
    # Latin supplement (Western):
    "\U00C0-\U00FF",
    # Latin supplement (Eastern):
    "\U0100-\U01BF",
    # Latin extended (phonetic):
    "\U01C4-\U02AF",
    # modern Greek:
    "\U0386\U0388-\U03FF",
    # Cyrillic:
    "\U0400-\U0481\U048A-\U0527",
    # Hebrew:
    "\U05D0-\U05EA\U05F0-\U05F4",
    # Arabic:
    "\U0620-\U065F\U066E-\U06D3\U06D5\U06DC",
    # extended Latin:
    "\U1E00-\U1EFF",
    # ancient Greek:
    "\U1F00-\U1FBC\U1FC2-\U1FCC\U1FD0-\U1FDB\U1FE0-\U1FEC\U1FF2-\U1FFC",
    # Coptic:
    "\U03E2-\U03EF\U2C80-\U2CF3",
    # Georgian:
    "\U10A0-\U10FF",
    "]+",
    sep="")
```

Alternatively, different tokenization rules can be applied through the option `splitting.rule` (see above). ATTENTION: this is the only piece of coding in the library `stylo` that might depend on the operating system used. While on Mac/Linux the native encoding is Unicode, on Windows you never know if your text will be loaded proprely. A considerable solution for Windows users is to convert your texts into Unicode (a variety of freeware converters are available on the internet), and to use an appropriate encoding option when loading the files: `read.table("file.txt", encoding`

= "UTF-8" or scan("file.txt", what = "char", encoding = "UTF-8". If you use the functions provided by the library stylo, you should pass this option as an argument to your chosen function: stylo(encoding = "UTF-8"), classify(encoding = "UTF-8"), oppose(encoding = "UTF-8").

Value

The function returns a vector of tokenized words (or other units) as elements.

Author(s)

Maciej Eder, Mike Kestemont

See Also

txt.to.words.ext, txt.to.features, make.ngrams, load.corpus

Examples

```
txt.to.words("And now, Laertes, what's the news with you?")

# retrieving grammatical codes (POS tags) from a tagged text:
tagged.text = "The_DT family_NN of_IN Dashwood_NNP had_VBD long_RB
               been_VBN settled_VBN in_IN Sussex_NNP ._."
txt.to.words(tagged.text, splitting.rule = "([A-Za-z,.;!]+_)|[ \n\t]")
```

---

txt.to.words.ext *Split text into words: extended version*

Description

Function for splitting a string of characters into single words, removing punctuation etc., and preserving some language-dependent idiosyncracies, such as common contractions in English.

Usage

```
txt.to.words.ext(input.text, corpus.lang = "English", splitting.rule = NULL,
                 preserve.case = FALSE)
```

Arguments

input.text	a string of characters, usually a text.
corpus.lang	an optional argument specifying the language of the texts analyzed. Values that will affect the function's output are: English.contr, English.all, Latin.corr (their meaning is explained below), JCK for Japanese, Chinese and Korean, as well as other for a variety of non-Latin scripts, including Cyryllic, Greek, Arabic, Hebrew, Coptic, Georgian etc. The default value is English.

`splitting.rule` if you are not satisfied with the default language settings (or your input string of characters is not a regular text, but a sequence of, say, dance movements represented using symbolic signs), you can indicate your custom splitting regular expression here. This option will overwrite the above language settings. For further details, refer to `help(txt.to.words)`.

`preserve.case` Whether or not to lowercase all character in the corpus (default = `FALSE`).

Details

Function for splitting a given input text into single words (chains of characters delimited with spaces or punctuation marks). It is build on top of the function `txt.to.words` and it is designed to manage some language-dependent text features during the tokenization process. In most languages, this is irrelevant. However, it might be important when with English or Latin texts: `English.contr` treats contractions as single, atomary words, i.e. strings such as "don't", "you've" etc. will not be split into two strings; `English.all` keeps the contractions (as above), and also prevents the function from splitting compound words (mother-in-law, double-decker, etc.). `Latin.corr`: since some editions do not distinguish the letters v/u, this setting provides a consistent conversion to "u" in the whole string. The option `preserve.case` lets you specify whether you wish to lowercase all characters in the corpus.

Author(s)

Maciej Eder, Mike Kestemont

See Also

`txt.to.words`, `txt.to.features`, `make.ngrams`

Examples

```
txt.to.words.ext("Nel mezzo del cammin di nostra vita / mi ritrovai per
    una selva oscura, che la diritta via era smarrita.")

# to see the difference between particular options for English,
# consider the following sentence from Joseph Conrad's "Nostromo":
sample.text = "That's how your money-making is justified here."
txt.to.words.ext(sample.text, corpus.lang = "English")
txt.to.words.ext(sample.text, corpus.lang = "English.contr")
txt.to.words.ext(sample.text, corpus.lang = "English.all")
```

---

zeta.chisquare *Compare two subcorpora using a home-brew variant of Craig's Zeta*

Description

This is a function for comparing two sets of texts; unlike keywords analysis, it this method the goal is to split input texts into equal-sized slices, and to check the appearance of particular words over the slices. Number of slices in which a given word appeared in the subcorpus A and B is then compared using standard chisquare test (if p value exceeds 0.05, a difference is considered significant). This method is based on original Zeta as developed by Burrows and extended by Craig (Burrows 2007, Craig and Kinney 2009).

Usage

```
zeta.chisquare(input.data)
```

Arguments

`input.data`	a matrix of two columns.

Value

The function returns a list of two elements: the first contains words (or other units, like n-grams) statistically preferred by the authors of the primary subcorpus, while the second element contains avoided words. Since the applied measure is symmetrical, the preferred words are ipso facto avoided by the secondary authors, and vice versa.

Author(s)

Maciej Eder

References

Burrows, J. F. (2007). All the way through: testing for authorship in different frequency strata. "Literary and Linguistic Computing", 22(1): 27-48.

Craig, H. and Kinney, A. F., eds. (2009). Shakespeare, Computers, and the Mystery of Authorship. Cambridge: Cambridge University Press.

See Also

`oppose`, `zeta.eder`, `zeta.craig`

Examples

```
## Not run:
zeta.chisquare(input.data, filter.threshold)

## End(Not run)
```

`zeta.craig` *Compare two subcorpora using Craig's Zeta*

Description

This is a function for comparing two sets of texts; unlike keywords analysis, it this method the goal is to split input texts into equal-sized slices, and to check the appearance of particular words over the slices. Number of slices in which a given word appeared in the subcorpus A and B is then compared using Craig's formula, which is based on original Zeta as developed by Burrows (Craig and Kinney 2009, Burrows 2007).

Usage

```
zeta.craig(input.data, filter.threshold)
```

Arguments

`input.data`	a matrix of two columns.
`filter.threshold`	this parameter (default 0.1) gets rid of words of weak discrimination strength; the higher the number, the less words appear in the final wordlists. It does not normally exceed 0.5. In original Craig's Zeta, no threshold is used: instead, the results contain the fixed number of 500 top avoided and 500 top preferred words.

Value

The function returns a list of two elements: the first contains words (or other units, like n-grams) statistically preferred by the authors of the primary subcorpus, while the second element contains avoided words. Since the applied measure is symmetrical, the preferred words are ipso facto avoided by the secondary authors, and vice versa.

Author(s)

Maciej Eder

References

Burrows, J. F. (2007). All the way through: testing for authorship in different frequency strata. "Literary and Linguistic Computing", 22(1): 27-48.

Craig, H. and Kinney, A. F., eds. (2009). Shakespeare, Computers, and the Mystery of Authorship. Cambridge: Cambridge University Press.

See Also

`oppose`, `zeta.eder`, `zeta.chisquare`

Examples

```
## Not run:
zeta.craig(input.data, filter.threshold)

## End(Not run)
```

`zeta.eder` *Compare two subcorpora using Eder's Zeta*

Description

This is a function for comparing two sets of texts; unlike keywords analysis, it this method the goal is to split input texts into equal-sized slices, and to check the appearance of particular words over the slices. Number of slices in which a given word appeared in the subcorpus A and B is then compared using a distance derived from Canberra measure of similarity. Original Zeta was developed by Burrows and extended by Craig (Burrows 2007, Craig and Kinney 2009).

Usage

```
zeta.eder(input.data, filter.threshold)
```

Arguments

`input.data`	a matrix of two columns.
`filter.threshold`	this parameter (default 0.1) gets rid of words of weak discrimination strength; the higher the number, the less words appear in the final wordlists. It does not normally exceed 0.5.

Value

The function returns a list of two elements: the first contains words (or other units, like n-grams) statistically preferred by the authors of the primary subcorpus, while the second element contains avoided words. Since the applied measure is symmetrical, the preferred words are ipso facto avoided by the secondary authors, and vice versa.

Author(s)

Maciej Eder

References

Burrows, J. F. (2007). All the way through: testing for authorship in different frequency strata. "Literary and Linguistic Computing", 22(1): 27-48.

Craig, H. and Kinney, A. F., eds. (2009). Shakespeare, Computers, and the Mystery of Authorship. Cambridge: Cambridge University Press.

See Also

oppose, zeta.craig, zeta.chisquare

Examples

```
## Not run:
zeta.eder(input.data, filter.threshold)

## End(Not run)
```

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