Package ‘oolong’

November 9, 2021

Title  Create Validation Tests for Automated Content Analysis

Version  0.4.1

Description  Intended to create standard human-in-the-loop validity tests for typical automated content analysis such as topic modeling and dictionary-based methods. This package offers a standard workflow with functions to prepare, administer and evaluate a human-in-the-loop validity test. This package provides functions for validating topic models using word intrusion, topic intrusion (Chang et al. 2009, <https://papers.nips.cc/paper/3700-reading-tea-leaves-how-humans-interpret-topic-models>) and word set intrusion (Ying et al. 2021) <doi:10.1017/pan.2021.33> tests. This package also provides functions for generating gold-standard data which are useful for validating dictionary-based methods. The default settings of all generated tests match those suggested in Chang et al. (2009) and Song et al. (2020) <doi:10.1080/10584609.2020.1723752>.

License  LGPL (>= 2.1)

Encoding  UTF-8

URL  https://github.com/chainsawriot/oolong

LazyData  true

Depends  R (>= 3.6)

Imports  keyATM (>= 0.2.2), purrr, tibble, shiny, digest, R6, quanteda

RoxygenNote  7.1.1.9001

Suggests  testthat (>= 3.0.2), text2vec (>= 0.6), BTM, dplyr, topicmodels, stm, seededlda, covr, stringr, knitr, rmarkdown, fs, quanteda.textmodels, shinytest

BugReports  https://github.com/chainsawriot/oolong/issues

VignetteBuilder  knitr

Config/testthat/edition  3

NeedsCompilation  no

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Repository  CRAN

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<th>abstracts</th>
<th>Abstracts of communication journals dataset</th>
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**Description**

This is a random sample of all abstracts of papers published in high-impact communication journals from 2000 to 2017. abstracts_dictionary is a list of terms that can be used for semisupervised techniques such as keyATM.

**Usage**

- abstracts
- abstracts_dfm
- abstracts_dictionary

**Format**

- An object of class tbl_df (inherits from tbl.data.frame) with 2500 rows and 1 columns.
- An object of class dfm with 2500 rows and 3998 columns.
- An object of class list of length 10.

**References**

abstracts_keyatm

<table>
<thead>
<tr>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>These are topic models trained with different topic model packages.</td>
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<tr>
<td>abstracts_keyatm</td>
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<tr>
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<table>
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<th>Format</th>
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<tbody>
<tr>
<td>An object of class <code>keyATM_output</code> (inherits from <code>base.list</code>) of length 18.</td>
</tr>
<tr>
<td>An object of class <code>WarpLDA</code> (inherits from <code>LDA, TopicModel, mlapiDecomposition, mlapiTransformation, mlapiBase, R6</code>) of length 9.</td>
</tr>
<tr>
<td>An object of class <code>BTM</code> of length 9.</td>
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</tbody>
</table>

afinn

<table>
<thead>
<tr>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>This is the AFINN sentiment dictionary in quanteda::dictionary format.</td>
</tr>
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</table>

<table>
<thead>
<tr>
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</tr>
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</tr>
</thead>
<tbody>
<tr>
<td>An object of class <code>dictionary2</code> of length 11.</td>
</tr>
</tbody>
</table>

References

check_oolong

Check whether the ooolong needs to be updated

Description

This function raises an error when the input ooolong object needs to be updated. Ooolong objects generated with an old version of ooolong need to be updated to use the functionalities from the recent versions of ooolong.

Usage

check_oolong(oolong, verbose = FALSE)

Arguments

oolong an ooolong object to be checked
verbose, logical, display messages

Value

Nothing

Author(s)

Chung-hong Chan

clone_oolong

Clone an ooolong object

Description

Clone a new ooolong object. The ooolong must not be locked and ever coded.

Usage

clone_oolong(oolong, userid = NA)

Arguments

oolong an ooolong object.
userid a character string to denote the name of the coder

Value

an ooolong object
create_ooolong

Author(s)
Chung-hong Chan

create_ooolong Generate an ooolong test

Description
create_ooolong generates an ooolong test object that can either be used for validating a topic model or for creating ground truth (gold standard) of a text corpus. wi (word intrusion test), ti (topic intrusion test), witi (word and topic intrusion tests), wsi (word set intrusion test) and gs are handy wrappers to create_ooolong. It is recommended to use these wrappers instead of create_ooolong.

Usage
create_ooolong(
  input_model = NULL,
  input_corpus = NULL,
  n_top_terms = 5,
  bottom_terms_percentile = 0.6,
  exact_n = NULL,
  frac = 0.01,
  n_top_topics = 3,
  n_topiclabel_words = 8,
  use_frex_words = FALSE,
  difficulty = 1,
  input_dfm = NULL,
  construct = "positive",
  btm_dataframe = NULL,
  n_correct_ws = 3,
  wsi_n_top_terms = 20,
  userid = NA,
  type = "witi"
)

wi(
  input_model = NULL,
  userid = NA,
  n_top_terms = 5,
  bottom_terms_percentile = 0.6,
  difficulty = 1,
  use_frex_words = FALSE
)

witi(
  input_model = NULL,
  n_top_terms = 5,
  bottom_terms_percentile = 0.6,
  difficulty = 1,
  use_frex_words = FALSE
)
create_ooolong

input_corpus = NULL,
userid = NA,
_n_top_terms = 5,
bottom_terms_percentile = 0.6,
extact_n = NULL,
frac = 0.01,
n_top_topics = 3,
n_topiclabel_words = 8,
use_frex_words = FALSE,
difficulty = 1,
input_dfm = NULL,
bm_dataframe = NULL
}

\(\text{ti} (\)
input_model = NULL,
input_corpus = NULL,
userid = NA,
extact_n = NULL,
frac = 0.01,
n_top_topics = 3,
n_topiclabel_words = 8,
use_frex_words = FALSE,
difficulty = 1,
input_dfm = NULL,
bm_dataframe = NULL
)}

wsi(
input_model = NULL,
userid = NA,
n_topiclabel_words = 4,
n_correct_ws = 3,
wsi_n_top_terms = 20,
difficulty = 1,
use_frex_words = FALSE
)

gs(
input_corpus = NULL,
userid = NA,
construct = "positive",
extact_n = NULL,
frac = 0.01
)
Arguments

**input_model**
(wi, ti, witi, wsi) a STM, WarpLDA, topicmodels, KeyATM, seededlda, textmodel_nb, or BTM object; if it is NULL, create_oolong assumes that you want to create gold standard.

**input_corpus**
(wi, ti, witi, gs) if input_model is not null, it should be the corpus (character vector or quanteda::corpus object) to generate the model object. If input_model and input_corpus are not NULL, topic intrusion test cases are generated. If input_model is a BTM object, this argument is ignored. If input_model is null, it generates gold standard test cases.

**n_top_terms**
(wi, witi) integer, number of top topic words to be included in the candidates of word intrusion test.

**bottom_terms_percentile**
(wi, witi) double, a term is considered to be an word intruder when its theta less than the percentile of this theta, must be within the range of 0 to 1

**exact_n**
(ti, witi, gs) integer, number of topic intrusion test cases to generate, ignore if frac is not NULL

**frac**
(ti, witi, gs) double, fraction of test cases to be generated from the corpus

**n_top_topics**
(wi, witi) integer, number of most relevant topics to be shown alongside the intruder topic

**n_topiclabel_words**
(witi, ti, wsi) integer, number of topic words to be shown as the topic ("ti" and "witi") / word set ("wsi") label

**use_frex_words**
(wi, witi, ti, wsi) logical, for a STM object, use FREX words if TRUE, use PROB words if FALSE

**difficulty**
(wi, witi, ti, wsi) double, adjust the difficulty of the test. Higher value indicates higher difficulty and must be within the range of 0 to 1, no effect for STM if use_frex_words is FALSE. Ignore for topicmodels objects

**input_dfm**
(wi, witi, ti, wsi) a dfm object used for training the input_model, if input_model is a WarpLDA object

**construct**
(gs) string, an adjective to describe the construct you want your coders to code the gold standard test cases

**btm_dataframe**
(wi, ti) dataframe used for training the input_model, if input_model is a BTM object

**n_correct_ws**
(wsi) number of word sets to be shown alongside the intruder word set

**wsi_n_top_terms**
(wsi) number of top topic words from each topic to be randomized selected as the word set label

**userid**
a character string to denote the name of the coder. Default to NA (no userid); not recommended

**type**
(create_oolong) a character string to denote what you want to create. "wi": word intrusion test; "ti": topic intrusion test; "witi": both word intrusion test and topic intrusion test; "gs": gold standard generation
Value

an oolong test object.

Usage

Use wi, ti, witi, wsi or gs to generate an oolong test of your choice. It is recommended to supply also userid (current coder). The names of the tests (word intrusion test and topic intrusion test) follow Chang et al (2009). In Ying et al. (forthcoming), topic intrusion test is named "T8WSI" (Top 8 Word Set Intrusion). Word set intrusion test in this package is actually the "R4WSI" (Random 4 Word Set Intrusion) in Lu et al (forthcoming). The default settings of wi, witi, and ti follow Chang et al (2009), e.g. n_top_terms = 5; instead of n_top_terms = 4 as in Lu et al (forthcoming). The default setting of wsi follows Ying et al. (forthcoming), e.g. n_topiclabel_words = 4. As suggested by Song et al. (2020), 1

About create_oolong

Because create_oolong is not intuitive to use, it is no longer recommended to use create_oolong to generate oolong test. create_oolong is retained only for backward compatibility purposes. This function generates an oolong test object based on input_model and input_corpus. If input_model is not NULL, it generates oolong test for a topic model (tm). If input_model is NULL but input_corpus is not NULL, it generates oolong test for generating gold standard (gs).

Methods

An oolong object, depends on its purpose, has the following methods:

$do_word_intrusion_test() (tm) launch the shiny-based word intrusion test. The coder should find out the intruder word that is not related to other words.

$do_topic_intrusion_test() (tm) launch the shiny-based topic intrusion test. The coder should find out the intruder topic that is least likely to be the topic of the document.

$do_word_set_intrusion_test() (tm) launch the shiny-based word set intrusion test. The coder should find out the intruder word set that is not related to other word sets.

$do_gold_standard_test() (gs) launch the shiny-based test for generating gold standard. The coder should determine the level of the predetermined constructs with a 5-point Likert scale.

$lock(force = FALSE) (gs/tm) lock the object so that it cannot be changed anymore. It enables summarize_oolong and the following method.

$turn_gold() (gs) convert the oolong object into a quanteda compatible corpus.

For more details, please see the overview vignette: vignette("overview", package = "oolong")

Author(s)

Chung-hong Chan, Marius Sältzer
**deploy_oolong**

**Guideline**

In most of the time, you should not use this function. You should write the deployable version of your app into a directory using `export_oolong` instead. Please refer to vignette("deploy",package = "oolong") for more details.

**Usage**

`deploy_oolong(oolong)`

**Arguments**

- `oolong`: an oolong object to be deployed. Please note that the "witi" type, i.e. oolong object with both word and topic intrusion tests, cannot be deployed. Also the object must not be locked and ever coded.
**export_ooolong**

**Value**

Nothing, it launches a deployable version of the coding interface

**Author(s)**

Chung-hong Chan

**Examples**

```r
# Please try this example in interactive R sessions only.
if (interactive()) {
  data(abstracts_stm)
  x <- wi(abstracts_stm)
  deploy_ooolong(x)
}
```

**Description**

This function exports your ooolong test into a launched Shiny app that is ideal for online deployment. Deploying the Shiny app online allows coders to conduct the test online with their browser, rather than having to install R on their own computer. In contrast to the testing interfaces launched with methods such as `$do_word_intrusion_test()`, the deployable version provides data download after the coder finished coding. Downloaded data can then revert back to a locked ooolong object using `revert_ooolong`. Further version might provide solutions to permanent storage. The deployable Shiny app will be in a directory. The Shiny app is both launchable with `shiny::runApp()` and deployable with `rsconnect::deployApp()`. Please refer to `vignette("deploy", package = "oolong")` for more details.

**Usage**

```r
export_ooolong(
  ooolong,
  dir = base::tempdir(),
  verbose = TRUE,
  use_full_path = TRUE
)
```

**Arguments**

- **oolong**: an ooolong object to be exported. Please note that the "witi" type, i.e. ooolong object with both word and topic intrusion tests, cannot be exported. Also the object must not be locked and ever coded.
- **dir**: character string, the directory to be exported. Default to a temporary directory
- **verbose**: logical, whether to display information after exporting
- **use_full_path**: logical, whether to expand dir into full path
**Value**

directory exported, invisible

**Author(s)**

Chung-hong Chan

**Examples**

```r
# Please try this example in interactive R sessions only.
if (interactive()) {
  data(abstracts_stm)
  x <- wi(abstracts_stm)
  export_oolong(x)
}
```

---

**newsgroup_nb**  
*Naive Bayes model trained on 20 newsgroups data*

**Description**

This is a Naive Bayes model (of the class 'textmodel_nb') trained on 20 newsgroups data.

**Usage**

newsgroup_nb

**Format**

An object of class textmodel_nb (inherits from textmodel,list) of length 7.

**References**

Description

The oolong package makes it very easy to create, administrate and evaluate typical automated content analysis tools by providing a framework for creating human-in-the-loop validation tests. For topic models, oolong can generate tests such as word intrusion test, topic intrusion test (Chang et al.) and word set intrusion test (Ying et al.) For dictionary-based methods, oolong can generate standardized interface for making gold standard (‘Ground truth’) data.

Author(s)

Chung-hong Chan

print.oolong_gold_standard

Description

This function prints a summary of the oolong gold standard object. An oolong gold standard object is a result of $turn_gold() method. It is a quanteda::corpus compatible object.

Usage

## S3 method for class 'oolong_gold_standard'
print(x, ...)

Arguments

x an oolong gold standard object

... other parameters

Value

None, a summary of the quanteda::corpus and what you should do are displayed

Author(s)

Chung-hong Chan
print.oolong_summary

print.oolong_summary   Print and plot oolong summary

Description

These functions print or plot a useful summary of the results from summarize_oolong. For details, please see the overview vignette: vignette("overview",package = "oolong")

Usage

## S3 method for class 'oolong_summary'
print(x, ...)

## S3 method for class 'oolong_summary'
plot(x, ...)

Arguments

x          an oolong_summary
...        other parameters

Value

None

Summary

Print function displays the following information:

Mean model precision  (wi, wsi) Higher value indicates better topic interpretability
Quantiles of model precision  (wi) Higher value indicates better topic interpretability
P-value of the model precision  (wi) Model precision’s p-value calculated by one-sample binomial test and Fisher’s Omnibus method.
Krippendorff’s alpha  (wi, wsi, gs) Krippendorff’s Alpha, if more than one oolong object is analyzed.
K Precision  (wi, wsi) Model precision for each topic.
Mean TLO  (ti) Mean topic log odds, higher value indicates better interpretability
Median TLO  (ti) Median topic log odds, higher value indicates better interpretability
Quantiles of TLO  (ti) Quantiles of topic log odds
P-Value of the median TLO  (ti) Median topic log odds’s p-value calculated by permutation test.
Correlation (average answer)  (gs) Pearson’s correlation between average answer and target value
Correlation (content length)  (gs) Pearson’s correlation between content length and target value
Diagnostic plot

Plot function displays a diagnostic plot with the following subplots (gs only).

- **Top left**  Correlation between answer from coders and target value to check for correlation between two values. Both axes are minmax transformed.
- **Top right**  Bland-altman plot of answer from coders and target value to check for agreement between two values.
- **Bottom left**  Correlation between target value and content length to check for the influence of content length.
- **Bottom right**  Cook’s distance to check for influential observations.

Author(s)

Chung-hong Chan

---

**revert_ooolong**  Obtain a locked ooolong from a downloaded data file

Description

To generate a locked ooolong object with the original ooolong object and the RDS file. The RDS file should have been downloaded from a deployed Shiny app.

Usage

`revert_ooolong(oolong, rds_file)`

Arguments

```
oolong  an ooolong object used for deployment
rds_file  path to the downloaded RDS file
```

Value

a locked ooolong object based on the data in the downloaded RDS file

Author(s)

Chung-hong Chan
**summarize_oolong**  

**Summarize oolong objects**

**Description**

This function summarizes one or more oolong objects. All oolong objects must be locked.

**Usage**

```r
summarize_oolong(..., target_value = NULL, n_iter = 1500)
```

```r
summarise_oolong(..., target_value = NULL, n_iter = 1500)
```

**Arguments**

- `...` (tm/gs) one or more oolong objects to be summarized
- `target_value` (gs) a vector of numeric values, the value you want to validate against the human-coded gold standard. One example of this target value is sentiment score extracted automatically from text
- `n_iter` (ti) number of iterations to calculate the median test

**Value**

An oolong summary. Depends on purpose, an oolong summary object has the following values:

- `$type` (gs/tm) type of analysis, either 'gs' or 'tm'
- `$kripp_alpha; $kripp_alpha_wsi` (wi, wsi) Krippendorff’s Alpha, if more than one oolong object is analyzed.
- `$rater_precision; $rater_precision_wsi` (wi, wsi) Model precision
- `$res$rater_precision_p_value` (wi) Model precision’s p-value calculated by one-sample binomial test and Fisher’s Omnibus method.
- `$k_precision; $k_precision_wsi` (wi, wsi) precision for each topic
- `$tlo` (ti) vector of topic log odds
- `$tlo_pvalue` (ti) Median topic log odds’s p-value calculated by permutation test.
- `$cor` (gs) Pearson’s correlation between average answer and target value
- `$cor_length` (gs) Pearson’s correlation between content length and target value
- `$diag_plot` (gs) diagnostic plot.

A useful summary of an object can be obtained either by `print.oolong_summary` or `plot.oolong_summary`. For details, please see the overview vignette: `vignette("overview",package = "oolong")`

**Author(s)**

Chung-hong Chan
References


Song et al. (2020) In validations we trust? The impact of imperfect human annotations as a gold standard on the quality of validation of automated content analysis. Political Communication.

Ying, L., Montgomery, J. M., & Stewart, B. M. (Forthcoming). Inferring concepts from topics: Towards procedures for validating topics as measures. Political Analysis.

Examples

```r
# Please try this example in interactive R sessions only.
if (interactive()) {
  data(abstracts_stm)
  oolong_test1 <- create_oolong(abstracts_stm)
  oolong_test2 <- clone_oolong(oolong_test1)
  oolong_test1$do_word_intrusion_test()
  oolong_test2$do_word_intrusion_test()
  oolong_test1$lock()
  oolong_test2$lock()
  summarize_oolong(oolong_test1, oolong_test2)
}
```

---

trump2k

*Trump’s tweets dataset*

Description

This is a random sample of 2000 tweets from @realdonaldtrump account before his assumption of duty as the president of the United States.

Usage

trump2k

Format

An object of class character of length 2000.
update_oolong

update_oolong \hspace{1cm} Update an oolong object to the latest version

Description
This function update an old oolong object to the latest version.

Usage
update_oolong(oolong, verbose = TRUE)

Arguments
- oolong: an oolong object to be updated
- verbose: logical, display messages

Value
an updated oolong object

Author(s)
Chung-hong Chan
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