
Linguistic Analyzer Documentation

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Contents:

1	Keyword module	1
2	KeywordList module	3
3	functionsv1 package	5
3.1	common_functions module	5
3.2	analyze_functions module	11
4	application module	15
5	unit_tests package	19
5.1	test_analyze module	19
5.2	test_extractmicrosoftdocxtext module	19
5.3	test_extractpdftext module	19
5.4	test_outputkeywordtotext module	19
5.5	test_pdfanddocxareadthesame module	20
6	behave_tests package	21
6.1	tutorial module	21
7	Indices and tables	23
	Python Module Index	25
	Index	27

class Keyword.**Keyword** (*nWord=""*, *nType=0*, *nSal=0*, *nFreq=0*, *nKeyscore=0*)

Bases: object

Summary: Stores a specific keyword and it's associated information. The constructor accepts the word, type, salience, frequency and keyscore of a specific keyword.

classmethod issimilar (*passedWord*)

Summary: Determines if the passed keyword is similar to (or exactly the same as) the main word in the class.

Parameters *passedWord* (*str*) – word

Returns boolean value of True or False

Return type bool

similarwordfrequency ()

Summary: Returns the frequency of a similar word in a document.

Returns frequency value

Return type int

wordfrequency ()

Summary: returns keyword frequency.

Returns frequency value

Return type int

KeywordList module

class KeywordList.**KeywordList**

Bases: object

Summary: A list that contains *Keyword*. *KeywordList* also contains unique keyword value, keyword score, Yule's K score, Yule's I score, average keyword score and a document score.

calculateavgscores ()

Summary: calculates a document's average score values and sets the values in the *KeywordList*

Returns void

Raises ZeroDivisionError

existsinlist (*keyword_name*)

Summary: searches through the list of keywords and sees if any keywords shares the same *Keyword.word*.

Parameters **keyword_name** (*str*) – The keyword

Returns returns true if a keyword with *keyword_name* as *Keyword.word* exists in the list. False otherwise.

Return type bool

getavgkeywordscore ()

Summary: returns document's average keyword score.

Returns score

Return type int

getdocumentscore ()

Summary: Returns document's score.

Returns score

Return type int

getindexofword (*keyword_name*)

Summary: returns the index of a *Keyword* in the list of Keywords.

Parameters `keyword_name` (*str*) – keyword

Returns keyword index

Return type int

getkeywordscore ()

Summary: returns document's keyword score.

Returns score

Return type float

getyulesiscore ()

Summary: returns document's Yule's I score.

Returns score

Return type float

getyuleskscore ()

Summary: returns document's Yule's I score.

Returns score

Rytpe float

insertkeyword (*keyword*)

Summary: inserts a new *Keyword* into *KeywordList*.

- A check if the keyword is a letter. If it's a letter, it will not be added to the list.
- A check if the keyword contains a comma. If a comma is present, it will not be added to the list.
- A check if the keyword already exists is handled by *existsinlist* (). If it does not exist, the *Keyword* is inserted into the list.

Parameters `keyword` (*Keyword*) – an instance of the class keyword

Returns void

3.1 common_functions module

`common_functions.changefileextension (regfilename)`

Summary: Changes the file name string from *.pdf* to *.txt*.

Parameters `regfilename` (*str*) – name of regulatory file

Returns string with *.txt* file extension

Return type *str*

`common_functions.cleantext (text_list)`

Summary: Removes special characters from text.

Parameters `text_list` (*List[str]*) – a text string

Returns *text_list* with no special chars

Return type *List[str]*

`common_functions.createkeywordfromgoogleapientity (entity, file_text)`

Summary: Creates a Keyword from a single entity that is returned by the google NLP API.

- The ‘name’ or Keyword, Type of keyword, Saliency score, and Frequency of the keyword is inputted in the *Keyword* object. A default value of 0 is used for the keyword score. Keyword score is determined further on in the app.
- The frequency of a keyword is found by using the *getwordfrequency()* function.

Parameters

- **entity** (*dict*) – Google API response entity object
- **file_text** (*List[str]*) – entire text of file

Returns Populated Keyword object

Return type *Keyword*

`common_functions.extractkeywordfromtxt(filename)`

Summary: This function will extract existing keyword information from *.txt file* and place it into the *KeywordList* object.

- This function will read in the first line of an existing *.txt* file and place the Yule's K, Yule's I, and average keyword score into a *KeywordList* object.
- For the second and remaining lines, the Keyword, Saliency score, Frequency of keyword, and Keyword score are placed into a *Keyword* object, and then inserted in a *KeywordList* object via the *KeywordList.KeywordList.insertkeyword()* function.
- An **Exception** will raise if the extraction of keywords from a *.txt* file does not fully complete. This is an issue that occurs in the AWS Beanstalk environment. Running the app on a local machine should not throw the Exception, based on testing.

Parameters `file (str)` – location of *.txt* file

Returns keyword list in file

Return type *KeywordList*

Raises Exception

`common_functions.extractmicrosoftdocxtext(file, testdownload_folder=None)`

Summary: Extracts text from any *.docx* document and returns it.

Parameters

- **file** (*fileStorage*) – the file to save
- **testdownload_folder** (*str*) – Specific download folder is necessary

Returns file's text

Return type List[str]

`common_functions.extractpdftext(file, testdownload_folder=None, RegDoc=False)`

Summary: Extracts text from PDF document referenced in the given file argument using the PDFMiner python package.

The first part of the code assigns a “chunk” size via the value *NUM_SEND_CHARS* set in */applicationconfig.json*. *chunk_size* is designated to break up a long string of text into a list of strings, if needed. The default setting for this allows for a single string of text.

Before starting the PDF text extraction, logging is disabled due to the amount of statements PDFMiner produces in the log.

Parameters

- **file** (*fileStorage*) – the PDF file to extract text from
- **testdownload_folder** (*str*) – specific download folder if necessary
- **RegDoc** (*bool*) – flag specifying whether this is a user doc or a regulatory doc

Returns file's text

Return type List[str]

Raises FileNotFoundError

`common_functions.generatebubblecsv(kw_list, reg_kw_list)`

Summary: Creates a new *csv* file with all the keywords. The *csv* file is used to generate the Bubble Chart.

Parameters

- **kw_list** (`KeywordList`) – list of doc keywords
- **reg_kw_list** (`KeywordList`) – list of reg doc keywords

Returns void

Raises Exception

`common_functions.geterrorpage (errtext='Unknown Error')`

Summary: Populates error message with proper response and returns html

Parameters **errtext** (`str`) – text of error

Returns html page with error displayed

Return type `str`

`common_functions.getregulatorydoctext (filename)`

Summary: Looks in the '/RegulatoryDocuments' folder for the file with the given *filename* and return's its text as a list of strings. The `extractpdftext ()` function is utilized.

Parameters **filename** (`str`) – name of regulatory file without file ending on it

Returns file text

Return type `List[str]`

Raises `FileNotFoundError`

`common_functions.getscorepage (kw_list, reg_kw_list, userdocwordcount, filename, regfilename)`

Summary: Returns 'views/score_response.html' page that is populated with proper calculated Keyword, Comparison, and Yule's scores.

Parameters

- **kw_list** (`KeywordList`) – list of user document's Keyword objects
- **reg_kw_list** (`KeywordList`) – list of regulatory document's Keywords
- **userdocwordcount** (`int`) – word count of user document
- **filename** (`str`) – user document's file name
- **regfilename** (`str`) – regulatory document's file name

Returns html page with scores displayed

Return type `str`

`common_functions.getwordfrequency (word, file_text)`

Summary: Determines frequency of the given word in the file's text

Parameters

- **word** (`str`) – Word to find frequency of
- **file_text** (`List[str]`) – list of string containing entire text of file

Returns frequency of word parameter in text

Return type `int`

`common_functions.homeCount ()`

Initializes variables for logging session

Returns void

`common_functions.interpretexistingfile (regfilename)`

Summary: Function that handles a newly uploaded regulatory doc or an existing regulatory document. The following occurs:

1. Checks *regfilename* to determine if it's a .pdf. If it's a .pdf, then that means that this is the first time a regulatory document has been published to the app. Analysis of the document needs to occur.
 - Extracts text from a pdf file with `getregulatorydoctext()`.
 - Identifies keywords with `analyze_functions.identifykeywords()`.
 - Calculates various scores for each keyword with `analyze_functions.calculatescores()` and `KeywordList.KeywordList.calculateavgscores()`.
 - The file extension is changed from .pdf to .txt. This is done so that the existing filename with extension can be used when exporting information to .txt file.
 - Exports keyword information to a .txt file via `outputkeywordtotext()`.
 - 'views/index.html' is edited to include the new regulatory document file path for future selection on the app home page. The file path points to the .txt version of the document so analysis does not occur again.
2. If the *regfilename* is not a pdf file, then it's a txt file. Analysis of the file does not need to occur since it was previously done.
 - The keywords with associated information are extracted from the txt file via `extractkeywordfromtxt()`.

Parameters *regfilename* (*str*) – name of regulatory file

Returns Keyword list of regulatory document.

Return type *KeywordList*

`common_functions.interpretfile (file, localuploadfolder)`

Summary: Function that handles uploaded user document. The following occurs:

1. Extracts text from a pdf file with `extractpdftext()`.
2. Identifies keywords with `analyze_functions.identifykeywords()`.
3. Calculates various scores for each keyword with `analyze_functions.calculatescores()` and `KeywordList.KeywordList.calculateavgscores()`.
4. Exports keyword information to a .txt file via `outputkeywordtotext()`.
5. Determines total word count for a file. The value is stored in the variable *wordcount*

Parameters

- **file** (*fileStorage*) – file to be interpreted
- **localuploadfolder** (*str*) – Place to temporary store file so it can be read from

Returns list of file's Keywords, wordcount

Return type *KeywordList*, int

`common_functions.kwhighestfrequencies (keyword_list, numtopkws=10)`

Summary: Returns the top 10 most frequent Keywords in an uploaded file.

Parameters

- **keyword_list** (*KeywordList*) – List of Keyword objects

- **numtopkws** (*int*) – number of keywords to return.

Returns Keywords with highest frequencies

Return type List[*Keyword*]

`common_functions.kwhighestkeyscores` (*keyword_list*)

Summary: Returns ten Keywords with the highest Keyword scores

Parameters **keyword_list** (*KeywordList*) – list of Keyword objects

Returns list of top keyword scores

Return type List[*Keyword*]

`common_functions.longstringtostringlist` (*longstring*, *strsize*)

Summary: This functions splits a long string *longstring* into strings of size *strsize* and returns a list of those strings.

Parameters

- **longstring** (*str*) – text of file
- **strsize** (*int*) – requested length of each string in created list of strings

Returns *return_list*

Return type List[*str*]

`common_functions.outputkeywordtotext` (*keylist*, *download_folder*=*'Documents/Keywords.txt'*)

Summary: This function will write Keywords and associated data from an analyzed document to a *.txt* file.

- The first line written to the file is the Yule's K, Yule's I and average keyscore of a *KeywordList* object.
- The second and following lines include the Keyword, Saliency score, Frequency of keyword, and the Keyword score from the *Keyword* object.
- An **Exception** will raise if the output of Keywords to a *.txt* file does not fully complete. This is an issue that occurs in the AWS Beanstalk environment. Running the app on a local machine should not throw the Exception, based on testing.

Parameters

- **keylist** (*KeywordList*) – list of document keywords
- **download_folder** (*str*) – location to save the *.txt* file.

Returns *void*

Raises Exception

`common_functions.plotkeywordfrequency` (*keyword_list1*, *keyword_list2*, *doc1name*=*'doc1'*, *doc2name*=*'doc2'*)

Summary: Plots keyword score of most frequently used keywords. Pulls keywords from *keyword_list1* and compares against *keyword_list2*. The *matplotlib* python package is used to aide in plotting the data.

If there are no common keywords to plot, a blank plot will display with the title "No Common Keywords to Plot".

Parameters

- **keyword_list1** (*KeywordList*) – user document keywords
- **keyword_list2** (*KeywordList*) – regulatory document keywords
- **doc1name** (*str*) – name of user document

- **doc2name** (*str*) – name of regulatory document

Returns void

`common_functions.plotkeywordsalience` (*keyword_list1*, *keyword_list2*, *doc1name*='doc1',
doc2name='doc2')

Summary: Plots salience scores of most frequently used keywords. Pulls keywords from *keyword_list1* and compares against *keyword_list2*. The `matplotlib` python package is used to aide in plotting the data.

If there are no common keywords to plot, a blank plot will display with the title “No Common Keywords to Plot”.

Parameters

- **keyword_list1** (*KeywordList*) – user *KeywordList*
- **keyword_list2** (*KeywordList*) – regulatory *KeywordList*
- **doc1name** (*str*) – user document name
- **doc2name** (*str*) – regulatory document name

Returns void

`common_functions.plotkeywordscores` (*keyword_list1*, *keyword_list2*, *doc1name*='doc1',
doc2name='doc2')

Summary: Plots keyword score of the most frequently used keywords. Pulls keywords from *keyword_list1* and compares against *keyword_list2*. The `matplotlib` python package is used to aide in plotting the data.

If there are no common keywords to plot, a blank plot will display with the title “No Common Keywords to Plot”.

Parameters

- **keyword_list1** (*KeywordList*) – user *KeywordList*
- **keyword_list2** (*KeywordList*) – regulatory *KeywordList*
- **doc1name** (*str*) – user document name
- **doc2name** (*str*) – regulatory document name

Returns void

`common_functions.printStringList` (*textList*)

Summary: Helper function that prints a list of strings

Parameters *textList* (*List[str]*) – a text string

Returns void

`common_functions.printanalytics` (*filename*, *regfilename*, *keywordlist*, *regkeywordlist*, *calctime*)

Summary: Saves the data passed in the argument to the ever-increasing file ‘/downloads/Analytics.txt’ that contains data analytics information. Analytic information includes:

- Date/Time
- Processing time
- user doc file name and number of keywords
- regulatory doc file name and number of keywords

Parameters

- **filename** (*str*) – name of user document file
- **regfilename** (*str*) – name of regulatory document file

- **keywordlist** (*KeywordList*) – user document Keyword list
- **regkeywordlist** (*KeywordList*) – regulatory document Keyword list.
- **calctime** (*int*) – processing time of app.

Returns void

`common_functions.savefile` (*file*, *download_folder=None*)

Summary: Save's given file to '/Downloads' folder.

Parameters

- **file** (*fileStorage*) – the file to save
- **download_folder** (*str*) – specific download folder if necessary

Returns void

`common_functions.splitintosize` (*file_text*)

Summary: This function splits a list of keywords of any length into a list of keywords each of length specified by NUM_SEND_CHARS in '/applicationconfig.json'

Parameters **file_text** (*list*) – list of document's words

Returns *file_text*

Return type List[str]

`common_functions.stringlisttolonglongstring` (*string_list*)

Summary: Helper function to turn a list of strings into one long long string.

Parameters **string_list** (*List[str]*) – a string of text

Returns file's text

Return type long str

`common_functions.writeToConfig` (*key*, *value*)

Summary: Writes *value* into the '/applicationconfig.json' file.

Parameters

- **key** (*str*) – variable in which *value* is being written to
- **value** – value

Returns none

3.2 analyze_functions module

`analyze_functions.calculatecomparisonscore` (*kw_list*, *reg_kw_list*)

Summary: Compares keywords in each document and assigns scores based on exact matches and peripheral matches (i.e. "risk" vs. "risk analysis").

1. List is populated for each document with x keywords, where x is equal to the length of the *KeywordList* containing the least elements.
2. Values are calculated to determine what various grades of comparison might be (green, orange, yellow, and red)
3. One list is compared to the other. If there is an exact keyword match, 5 points are added to the total *score*. If there is a peripheral match, then 3 points are added to total.

4. The final score is returned. $(score/POINTS_POSSIBLE) * 100$

Parameters

- **kw_list** (`KeywordList`) – list of Keywords
- **reg_kw_list** (`KeywordList`) – list of Keywords

Returns comparison score of two documents

Return type float

`analyze_functions.calculatekeywordscore(kw_list, file_text, kw)`

Summary: calculate a keyword score for a single keyword. The current algorithm utilized is: $[(keyword\ salience * keyword\ frequency) / (total\ keywords)] * 1000$. Since the salience and frequency of a particular keyword is important to the overall feel of a document, these values are used to calculate the score.

Parameters

- **kw_list** (`KeywordList`) – all Keywords of a document.
- **kw** (`Keyword`) – keyword

Returns keyword score

Return type float

`analyze_functions.calculatescores(kw_list, file_text)`

Summary: function that calls `calculatekeywordscore()` and `calculateyulescore()` and inputs those values into `Keyword` and `KeywordList` respectively for a particular document.

Parameters

- **kw_list** (`KeywordList`) – list of Keywords
- **file_text** (`List[str]`) – Text of file

Returns void

`analyze_functions.calculateyulescore(file_text)`

Summary: calculates Yule's K/I scores for a given document. These scores are used to determine the lexical richness of a given document.

This function starts by ensuring that `file_text` is converted into a long string vice a list of strings to ensure accurate calculation of the scores. Then, the string is split into tokens via `tokenize()`. The Yule's K/I algorithm is implemented based on the tokens provided. If there is a 'Division by Zero' error, an exception will be raised and the default score value will be '-1'

Parameters **file_text** (`List[str]`) – plain text of document

Returns Yules score of text file [Yule's K, Yule's I]

Return type float

Raises ZeroDivisionError

`analyze_functions.declarelogger()`

Summary: Declares logger for the current session. Logging statements are re-directed to a local logging file. The logging level is set to DEBUG.

LOG_FILE_PATH = 'logging/Linguistic_Analyzer.log'

`analyze_functions.identifykeywords(file_text)`

Summary: Calls the Google NLP API to extract Keyword information from text. The 'analyze entities' from

the API is utilized. The information retained from the API is ‘entity’ (keyword) and the ‘salience’ value of a particular keyword.

Information regarding the Google NLP API can be found at: <https://cloud.google.com/natural-language/>

For use on a local machine: add `export API_KEY="your API key"` in `bash.profile` or whichever file contains environmental variable setup.

For use in AWS: enter ‘API_KEY’ with key value in AWS configuration settings

`file_text` contains the text of a particular document in a list of strings. The original idea here was concern that a long string of text would crash the app due to memory constraints. However, if document text is broken up and sent to the API as such, the analysis would not encompass the document in its entirety. Instead, the scores provided would be focused on each ‘chunk’ of text. Therefore, analysis of an entire document would be inaccurate. The list of strings idea here has remained, but the ‘chunk’ size for `file_text` can be configured in `/applicationconfig.json`. Default settings allow for a single string text input of a document into the API.

For each entity identified by the API, `common_functions.createkeywordfromgoogleapientity()` is used to extract the information from the `entities` dictionary variable and places it into a `Keyword`. The returned `Keyword` is then placed into the `KeywordList` object via `KeywordList.KeywordList.insertkeyword()`.

Parameters `file_text` (`List[str]`) – text of document

Returns `KeywordList` object

Return type `KeywordList`

Raises `Exception`

`analyze_functions.tokenize(tokenStr)`

Summary: Splits up string into individual tokens.

Parameters `tokenStr` (`str`) – a string of words

Returns `tokens`

Return type `list`

`application.analyze()`

Summary: Receives uploaded document and comparison document choice and executes various functions to compare them.

- This functions starts by verifying that a valid file has been uploaded. Error handling also occurs here if no file has been selected.
- Process User Document
 - All functions relating to the analysis of a user doc is handled by `common_functions.interpretfile()`.
- Process Regulatory Document
 - All functions relating to the analysis of a reg doc is handled by `common_functions.interpretexistingfile()`.
- Process Various Graph Displays
 - All functions related to processing graphical displays of the analyzed data is handled here.
 - * `common_functions.plotkeywordsalience()`.
 - * `common_functions.plotkeywordscores()`.
 - * `common_functions.plotkeywordfrequency()`.
 - * `common_functions.generatebubblecsv()`.

An **Exception** will be raised if there is an error in the analysis process. An “*Unknown Error Has Occurred*” web page will be displayed.

Returns Information regarding the uploaded document’s similarity to regulatory document

Return type html

Raises Exception

`application.bubbletest()`

Summary: Page for bubble chart testing.

Returns Test page

Return type html

`application.comparisoninfo()`

Summary: Returns an html page regarding comparison score information.

Returns graph html page that describes the Linguistic Analyzer's Comparison Score

Return type html

`application.getapplicationconfig()`

Summary: Returns a json application config file.

Returns `/applicationconfig.json`

Return type json

`application.getbackgroundimg()`

Summary: Returns *png* image of file.

Returns graph

Return type png

`application.getbackgroundwordsimg()`

Summary: Returns *png* image of a graph of words background.

Returns graph

Return type png

`application.getcsvkeywords()`

Summary: Returns "csvkeywords.csv" which contains keywords for bubble chart information.

Returns csvkeywords keyword file

Return type csv

`application.getdocumentationhome()`

Summary: Returns redirect page where app documentation is referenced.

Returns html text

Return type str

`application.getkwfreeqimage()`

Summary: Returns *png* image of a keyword frequency graph.

Returns graph

Return type png

`application.getkwsalienceimage()`

Summary: Returns *png* image of a graph of top salience keywords.

Returns graph

Return type png

`application.getkwscoresimage()`

Summary: Returns *png* image of a graph of keyword scores.

Returns graph

Return type png

`application.getlinguisticanalyzerlog()`

Summary: Returns "LinguisticAnalyzer.log".

Returns log file

Return type log

`application.getregdockws()`

Summary: Returns "Reg_Keywords.txt" which contains information regarding a regulatory document's keywords.

Returns regulatory doc keyword file

Return type txt

`application.gettestkeywords()`

Summary: Returns "test_keywords.csv" which contains keywords for bubble chart information.

Returns test_keywords doc keyword file

Return type csv

`application.getuserdockws()`

Summary: Returns "Keywords.txt" which contains information regarding a user's document keywords.

Returns keyword file

Return type txt

`application.indexjs()`

Summary: Page for testing

Returns Test page

Return type html

`application.keywordbubblechart()`

Summary: Returns bubble chart html page.

Returns bubble chart html page

Return type html

`application.main()`

Summary: Home page of the Linguistic Analyzer API.

A *loggerStart* variable is used here to keep track of home page instances in relation to logging. *analyze_functions.declarelogger()* is used to start a new instance of the log.

Returns Home page

Return type html

`application.newregdoc()`

Summary: Dynamically adds a new regulatory document to the app.

- A new regulatory document is saved into the app via *common_functions.savefile()*.
- */views/index.html* is edited to include a reference to the new regulatory document so it can be selected by user.
- Home page is reloaded with newly added document reference.

Returns updated */views/index.html* page

Return type html

`application.project()`

Summary: Returns an html page containing details about the Linguistic Analyzer project.

Returns App summary

Return type html

`application.resource_path(relative_path)`

Summary: Function to determine correct file path of directories for use within an IDE or executable.

Parameters `relative_path` (*str*) – the path of a directory relative to a local environment

Returns *base_path* in relation to executable environment and *relative_path* of local environment

Return type str

`application.reusablebubble()`

Summary: Page for bubble chart testing.

Returns Test page

Return type html

`application.reusablebubblejs()`

Summary: Page for bubble chart testing.

Returns Test page

Return type html

`application.yulesinfo()`

Summary: Returns an html page regarding Yule's Info.

Returns Page that describes Yule's K and Yule's I algorithms

Return type html

5.1 test_analyze module

```
class unit_tests.test_analyze.TestAnalyze (methodName='runTest')  
    Bases: unittest.case.TestCase  
  
    test_analyze ()  
        Summary: Tests the Analyze() function
```

5.2 test_extractmicrosoftdocxtext module

```
class unit_tests.test_extractmicrosoftdocxtext.TestExtractmicrosoftdocxtext (methodName='runTest')  
    Bases: unittest.case.TestCase  
  
    test_extractmicrosoftdocxtext ()  
        Summary: Tests the extractmicrosoftdocxtext() function
```

5.3 test_extractpdftext module

```
class unit_tests.test_extractpdftext.TestExtractpdftext (methodName='runTest')  
    Bases: unittest.case.TestCase  
  
    test_extractpdftext ()  
        Summary: Tests the extractpdftext() function
```

5.4 test_outputkeywordtotext module

```
class unit_tests.test_outputkeywordtotext.TestOutputkeywordtotext (methodName='runTest')  
    Bases: unittest.case.TestCase
```

```
test_outputkeywordtotext()
```

5.5 test_pdfanddocxarereadthesame module

```
class unit_tests.test_pdfanddocxarereadthesame.TestEnsurepdfanddocxarereadthesame(methodName)
    Bases: unittest.case.TestCase

    test_ensurepdfanddocarereadthesame()
        Summary: tests whether extractpdftext() and extractdocxtext() return the same exact information when
        given the same document in different formats
```

behave_tests package

6.1 tutorial module

```
behave_tests.tutorial.steps.tutorial.step_impl (context)  
    @type context: behave.runner.Context
```


CHAPTER 7

Indices and tables

- `genindex`
- `modindex`
- `search`

a

`analyze_functions`, [11](#)
`application`, [15](#)

b

`behave_tests.tutorial.steps.tutorial`,
[21](#)

c

`common_functions`, [5](#)

k

`Keyword`, [1](#)
`KeywordList`, [3](#)

u

`unit_tests.test_analyze`, [19](#)
`unit_tests.test_extractmicrosoftdocxtext`,
[19](#)
`unit_tests.test_extractpdftext`, [19](#)
`unit_tests.test_outputkeywordtotext`, [19](#)
`unit_tests.test_pdfanddocxarereadthesame`,
[20](#)

A

analyze() (in module application), 15
 analyze_functions (module), 11
 application (module), 15

B

behave_tests.tutorial.steps.tutorial (module), 21
 bubbletest() (in module application), 15

C

calculateavgcores() (KeywordList.KeywordList method), 3
 calculatecomparisonscore() (in module analyze_functions), 11
 calculatekeywordscore() (in module analyze_functions), 12
 calculatetimescores() (in module analyze_functions), 12
 calculateyulescore() (in module analyze_functions), 12
 changefileextension() (in module common_functions), 5
 cleantext() (in module common_functions), 5
 common_functions (module), 5
 comparisoninfo() (in module application), 16
 createkeywordfromgoogleapientity() (in module common_functions), 5

D

declarelogger() (in module analyze_functions), 12

E

existsinlist() (KeywordList.KeywordList method), 3
 extractkeywordfromtxt() (in module common_functions), 5
 extractmicrosoftdocxtext() (in module common_functions), 6
 extractpdftext() (in module common_functions), 6

G

generatebubblecsv() (in module common_functions), 6
 getapplicationconfig() (in module application), 16

getavgkeywordscore() (KeywordList.KeywordList method), 3
 getbackgroundimg() (in module application), 16
 getbackgroundwordsim() (in module application), 16
 getcsvkeywords() (in module application), 16
 getdocumentationhome() (in module application), 16
 getdocumentscore() (KeywordList.KeywordList method), 3
 geterrorpage() (in module common_functions), 7
 getindexofword() (KeywordList.KeywordList method), 3
 getkeywordscore() (KeywordList.KeywordList method), 4
 getkwfreeqimage() (in module application), 16
 getkwsalienceimage() (in module application), 16
 getkwscoresimage() (in module application), 16
 getlinguisticalyzerlog() (in module application), 16
 getregdockws() (in module application), 17
 getregulatorydoctext() (in module common_functions), 7
 getscorepage() (in module common_functions), 7
 gettestkeywords() (in module application), 17
 getuserdockws() (in module application), 17
 getwordfrequency() (in module common_functions), 7
 getyulesiscore() (KeywordList.KeywordList method), 4
 getyuleskscore() (KeywordList.KeywordList method), 4

H

homeCount() (in module common_functions), 7

I

identifykeywords() (in module analyze_functions), 12
 indexjs() (in module application), 17
 insertkeyword() (KeywordList.KeywordList method), 4
 interpretexistingfile() (in module common_functions), 7
 interpretfile() (in module common_functions), 8
 issimilar() (Keyword.Keyword class method), 1

K

Keyword (class in Keyword), 1
 Keyword (module), 1

keywordbubblechart() (in module application), 17
 KeywordList (class in KeywordList), 3
 KeywordList (module), 3
 kwhighestfrequencies() (in module common_functions), 8
 kwhighestkeyscores() (in module common_functions), 9

L

longstringtostringlist() (in module common_functions), 9

M

main() (in module application), 17

N

newregdoc() (in module application), 17

O

outputkeywordtotext() (in module common_functions), 9

P

plotkeywordfrequency() (in module common_functions), 9

plotkeywordsalience() (in module common_functions), 10

plotkeywordscores() (in module common_functions), 10

printanalytics() (in module common_functions), 10

printStringList() (in module common_functions), 10

project() (in module application), 17

R

resource_path() (in module application), 18

reusablebubble() (in module application), 18

reusablebubbles() (in module application), 18

S

savefile() (in module common_functions), 11

similarwordfrequency() (Keyword.Keyword method), 1

splitintosize() (in module common_functions), 11

step_impl() (in module be-
have_tests.tutorial.steps.tutorial), 21

stringlisttolonglongstring() (in module com-
mon_functions), 11

T

test_analyze() (unit_tests.test_analyze.TestAnalyze
method), 19

test_ensurepdfanddocarereadthesame()
(unit_tests.test_pdfanddocarereadthesame.TestEnsurepdfanddocarereadthesame
method), 20

test_extractmicrosoftdocxtext()
(unit_tests.test_extractmicrosoftdocxtext.TestExtractmicrosoftdocxtext
method), 19

test_extractpdftext() (unit_tests.test_extractpdftext.TestExtractpdftext
method), 19

test_outputkeywordtotext()
(unit_tests.test_outputkeywordtotext.TestOutputkeywordtotext
method), 19

TestAnalyze (class in unit_tests.test_analyze), 19

TestEnsurepdfanddocarereadthesame (class in
unit_tests.test_pdfanddocarereadthesame), 20

TestExtractmicrosoftdocxtext (class in
unit_tests.test_extractmicrosoftdocxtext),
19

TestExtractpdftext (class in
unit_tests.test_extractpdftext), 19

TestOutputkeywordtotext (class in
unit_tests.test_outputkeywordtotext), 19

tokenize() (in module analyze_functions), 13

U

unit_tests.test_analyze (module), 19

unit_tests.test_extractmicrosoftdocxtext (module), 19

unit_tests.test_extractpdftext (module), 19

unit_tests.test_outputkeywordtotext (module), 19

unit_tests.test_pdfanddocarereadthesame (module), 20

W

wordfrequency() (Keyword.Keyword method), 1

writeToConfig() (in module common_functions), 11

Y

yulesinfo() (in module application), 18