CWordTM Toolkit Usage on BBC News

This Jupyter notebook demonstrates how to use the package "CWordTM" on the BBC News:

1. Meta Information Features
2. Utility Features
3. Text Visualization - Word Cloud
4. Text Summarization
5. Topic Modeling - LDA

CWordTM Toolkit's Documentation: https://cwordtm.readthedocs.io

In [1]:
```
import warnings
warnings.filterwarnings('ignore')
```

1. Meta Information Features

In [2]:
```
import cwordtm
from cwordtm import *
cwordtm.__version__
```

Out[2]:
```
'0.6.4'
```

In [3]:
```
# Show brief module information
# print(meta.get_module_info())

# Show function signature of all functions in a submodule
print(meta.get_submodule_info("viz"))
```

```
The function(s) of the submodule 'cwordtm.viz':

   chi_wordcloud (docs, figsize=(15, 10), bg='white', image=0, *, timing=False, co
de=0)
   plot_cloud (wordcloud, figsize, *, timing=False, code=0)
   show_wordcloud (docs, clean=False, figsize=(12, 8), bg='white', image=0, *, tim
ing=False, code=0)
```

In [4]:
```
# Show source code of all the functions in a submodule
print(meta.get_submodule_info("viz", detailed=True))
```

```
The function(s) of the submodule 'cwordtm.viz':

def chi_wordcloud(docs, figsize=(15, 10), bg='white', image=0):
    """Prepare and show a Chinese wordcloud

    :param docs: The collection of Chinese documents for preparing a wordcloud,
        default to None
    :type docs: pandas.DataFrame
    :param figsize: Size (width, height) of word cloud, default to (15, 10)
    :type figsize: tuple, optional
    :param bg: The background color (name) of the wordcloud, default to 'white'
    :type bg: str, optional
    :param image: The filename of the presribed image as the mask of the wordclou
d,
        or 1/2/3/4 for using an internal image (heart / disc / triangle / arrow),
        default to 0 (No image mask)
    :type image: int or str, optional
    """

    util.set_lang('chi')
    diction = util.get_diction(docs)

    masks = ['heart.jpg', 'disc.jpg', 'triangle.jpg', 'arrow.jpg']

    if image == 0:
        mask = None
    elif image in [1, 2, 3, 4]:  # Internal image file
        img_file = files('cwordtm.images').joinpath(masks[image-1])
        mask = np.array(Image.open(img_file))
    elif isinstance(image, str) and len(image) > 0:
        mask = np.array(Image.open(image))
    else:
        mask = None

    font_file = files('cwordtm.data').joinpath('msyh.ttc')
    wordcloud = WordCloud(background_color=bg, colormap='Set2',
                          mask=mask, font_path=str(font_file)) \
                    .generate_from_frequencies(frequencies=diction)

    plot_cloud(wordcloud, figsize=figsize)

def plot_cloud(wordcloud, figsize):
    """Plot the prepared 'wordcloud'
    :param wordcloud: The WordCloud object for plotting, default to None
    :type wordcloud: WordCloud object
    :param figsize: Size (width, height) of word cloud, default to None
    :type figsize: tuple
    """

    plt.figure(figsize=figsize)
    plt.imshow(wordcloud)
    plt.axis("off");

def show_wordcloud(docs, clean=False, figsize=(12, 8), bg='white', image=0):
    """Prepare and show a wordcloud

    :param docs: The collection of documents for preparing a wordcloud,
        default to None
    :type docs: pandas.DataFrame
    :param clean: The flag whether text preprocessing is needed,
        default to False
    :type clean: bool, optional
    :param figsize: Size (width, height) of word cloud, default to (12, 8)
    :type figsize: tuple, optional
```

```
    :param bg: The background color (name) of the wordcloud, default to 'white'
    :type bg: str, optional
    :param image: The filename of the presribed image as the mask of the wordclou
d,
        or 1/2/3/4 for using an internal image (heart / disc / triangle / arrow),
        default to 0 (No image mask)
    :type image: int or str, optional
    """

    masks = ['heart.jpg', 'disc.jpg', 'triangle.jpg', 'arrow.jpg']

    if image == 0:
        mask = None
    elif image in [1, 2, 3, 4]:  # Internal image file
        img_file = files('cwordtm.images').joinpath(masks[image-1])
        mask = np.array(Image.open(img_file))
    elif isinstance(image, str) and len(image) > 0:
        mask = np.array(Image.open(image))
    else:
        mask = None

    if isinstance(docs, pd.DataFrame):
        docs = ' '.join(list(docs.text.astype(str)))
    elif isinstance(docs, pd.Series):
        docs = ' '.join(list(docs.astype(str)))
    elif isinstance(docs, list) or isinstance(docs, np.ndarray):
        docs = ' '.join(str(doc) for doc in docs)

    if clean:
        docs = util.preprocess_text(docs)

    wordcloud = WordCloud(background_color=bg, colormap='Set2', mask=mask) \
                    .generate(docs)

    plot_cloud(wordcloud, figsize=figsize)
```

2. Utility Features

Load BBC News

In [5]:
```
bbc_news = "BBC/BBC News Train.csv"
df = util.load_text(bbc_news, info=True)
```

```
Dataset Information:
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1490 entries, 0 to 1489
Data columns (total 3 columns):
 #   Column     Non-Null Count  Dtype 
---  ------     --------------  ----- 
 0   ArticleId  1490 non-null   int64 
 1   Text       1490 non-null   object
 2   Category   1490 non-null   object
dtypes: int64(1), object(2)
memory usage: 35.0+ KB
```

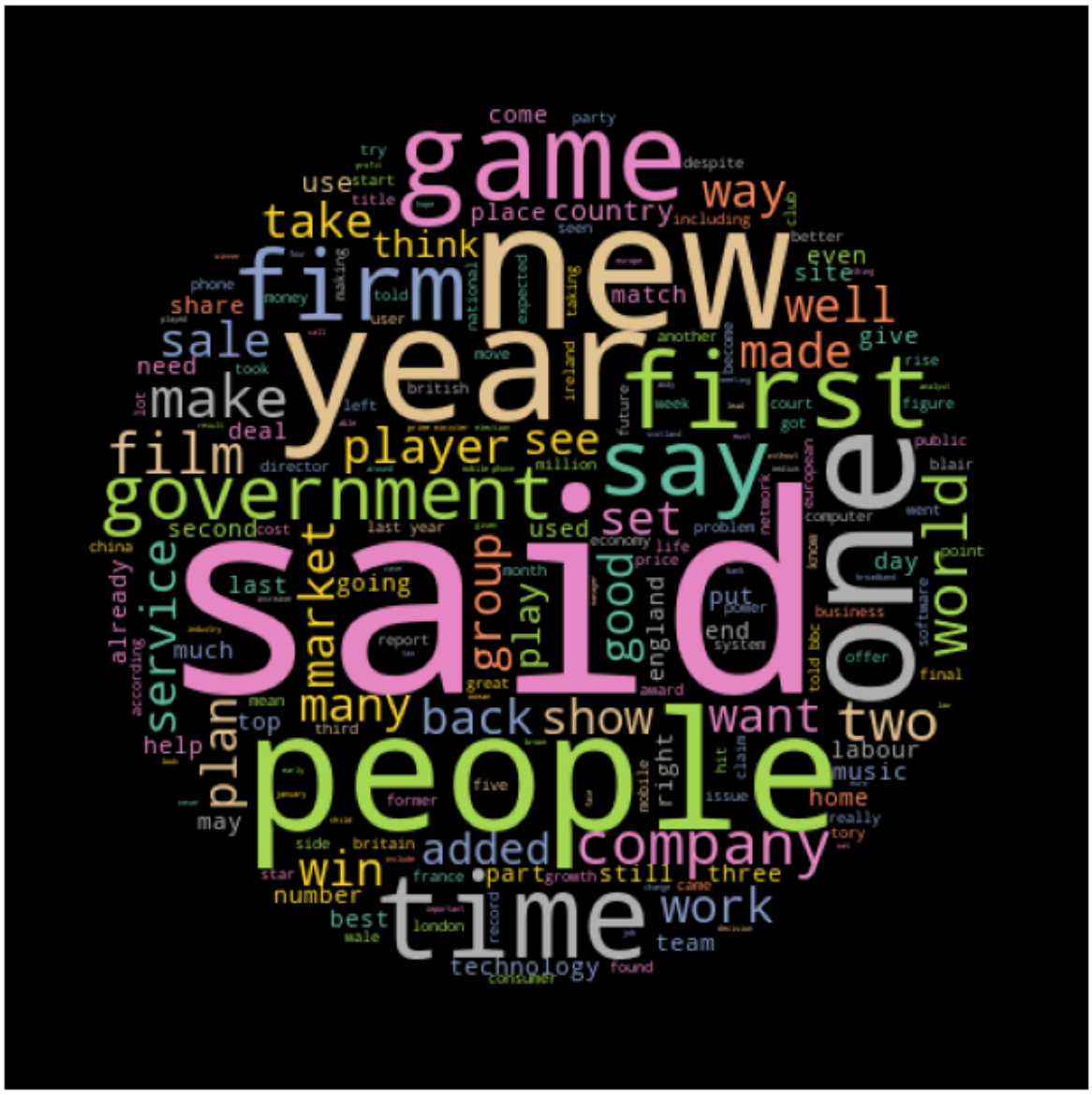
Preprocessing Text

In [6]:
```
text_list = util.get_text_list(df.iloc[:500], text_col='Text')
text = util.preprocess_text(text_list)
```

3. Text Visualization - Word Cloud

In [7]:
```
# Black background with the prescribed image as the mask
viz.show_wordcloud(text, bg='black', image='images/disc.png')
```

```
C:\Dev\Anaconda3\envs\aiml\lib\site-packages\wordcloud\wordcloud.py:106: MatplotlibDeprecationWarning: The get_cmap function was deprecated in Matplotlib 3.7 and will be removed two minor releases later. Use ``matplotlib.colormaps[name]`` or ``matplotlib.colormaps.get_cmap(obj)`` instead.
  self.colormap = plt.cm.get_cmap(colormap)
```



4. Text Summarization

In [8]:
```
news = df.iloc[:5]['Text']
ta.summary_en(news, sent_len=5)
```

Out[8]:
```
['but ms cooper  who now runs her own consulting business  told a jury in new york on wednesday that external auditors arthur andersen had approved worldcom s accounting in early 2001 and 2002. she said andersen had given a  green light  to the procedures and practices used by worldcom.',
 'cynthia cooper  worldcom s ex-head of internal accounting  alerted directors to irregular accounting practices at the us telecoms giant in 2002. her warnings led to the collapse of the firm following the discovery of an $11bn (£5.7bn) accounting fraud.',
 'prosecution lawyers have argued that mr ebbers orchestrated a series of accounting tricks at worldcom  ordering employees to hide expenses and inflate revenues to meet wall street earnings estimates.',
 'the university of california said the trial in the case is scheduled to begin in october 2006. it joined the lawsuit in december 2001alleging  massive insider trading  and fraud  claiming it had lost $145m on its investments in the company.',
 'the bbc s david willey in rome says one reason for that result is the changeover from the lira to the euro in 2001  which is widely viewed as the biggest reason why their wages and salaries are worth less than they used to be.']
```

In [9]:
```
# pivot.pivot(df, column='Category')
```

5. Topic Modeling

In [10]:
```
import warnings
warnings.filterwarnings('ignore')
```

LDA Modeling

In [11]:
```
lda = tm.lda_process(bbc_news, source=1, text_col='Text', eval=True, timing=True)
```

```
Corpus loaded!
Text preprocessed!
Text trained!
If no visualization is shown,
  you may execute the following commands to show the visualization:
    > import pyLDAvis
    > pyLDAvis.display(lda.vis_data)
Visualization prepared!

Topics from LDA Model:
[(0,
  '0.005*"wa" + 0.005*"said" + 0.004*"ha" + 0.003*"mr" + 0.003*"year" + '
  '0.002*"film" + 0.001*"new" + 0.001*"sale" + 0.001*"company" + '
  '0.001*"people"'),
 (1,
  '0.006*"said" + 0.006*"wa" + 0.003*"ha" + 0.003*"year" + 0.003*"mr" + '
  '0.001*"time" + 0.001*"company" + 0.001*"open" + 0.001*"game" + 0.001*"bn"'),
 (2,
  '0.005*"said" + 0.004*"wa" + 0.003*"ha" + 0.002*"year" + 0.002*"rate" + '
  '0.002*"market" + 0.001*"figure" + 0.001*"new" + 0.001*"game" + '
  '0.001*"price"'),
 (3,
  '0.007*"said" + 0.006*"wa" + 0.005*"ha" + 0.002*"year" + 0.002*"mr" + '
  '0.002*"new" + 0.002*"film" + 0.001*"people" + 0.001*"government" + '
  '0.001*"uk"'),
 (4,
  '0.006*"said" + 0.005*"wa" + 0.005*"ha" + 0.003*"mr" + 0.002*"year" + '
  '0.002*"new" + 0.002*"best" + 0.001*"game" + 0.001*"people" + 0.001*"film"'),
 (5,
  '0.008*"said" + 0.006*"wa" + 0.005*"ha" + 0.004*"mr" + 0.003*"year" + '
  '0.002*"people" + 0.002*"new" + 0.002*"say" + 0.002*"labour" + '
  '0.002*"blair"'),
 (6,
  '0.004*"wa" + 0.004*"said" + 0.004*"ha" + 0.003*"game" + 0.002*"mr" + '
  '0.002*"time" + 0.002*"people" + 0.002*"year" + 0.002*"new" + 0.001*"say"'),
 (7,
  '0.005*"said" + 0.004*"wa" + 0.002*"ha" + 0.002*"people" + 0.002*"mobile" + '
  '0.002*"phone" + 0.002*"year" + 0.001*"service" + 0.001*"new" + '
  '0.001*"firm"'),
 (8,
  '0.005*"said" + 0.004*"wa" + 0.003*"ha" + 0.002*"mr" + 0.002*"year" + '
  '0.002*"new" + 0.002*"firm" + 0.001*"people" + 0.001*"virus" + '
  '0.001*"company"'),
 (9,
  '0.005*"said" + 0.004*"wa" + 0.003*"ha" + 0.003*"people" + 0.002*"mr" + '
  '0.002*"new" + 0.002*"year" + 0.001*"uk" + 0.001*"party" + 0.001*"tv"')]

Model Evaluation Scores:
  Coherence: 0.6561566725350969
  Perplexity: -11.239467195159088
  Topic diversity: 0.0007223139091270854
  Topic size distribution: 0.0018315018315018315

Finished 'lda_process' in 142.1018 secs
```

In [12]:
```
# LDA Model Visualization
import pyLDAvis
pyLDAvis.display(lda.vis_data)
```

Out[12]:

Save LDA Model

In [13]:
```
lda.save("models/lda_bbc.gensim")
```

```
LDA model has been stored in 'models/lda_bbc.gensim'.
```

Load LDA Model

In [14]:
```
lda2 = tm.LDA("", lda.num_topics)
lda2.model = lda2.load("models/lda_bbc.gensim")
lda2.show_topics()
```

```
Topics from LDA Model:
[(0,
  '0.005*"wa" + 0.005*"said" + 0.004*"ha" + 0.003*"mr" + 0.003*"year" + '
  '0.002*"film" + 0.001*"new" + 0.001*"sale" + 0.001*"company" + '
  '0.001*"people"'),
 (1,
  '0.006*"said" + 0.006*"wa" + 0.003*"ha" + 0.003*"year" + 0.003*"mr" + '
  '0.001*"time" + 0.001*"company" + 0.001*"open" + 0.001*"game" + 0.001*"bn"'),
 (2,
  '0.005*"said" + 0.004*"wa" + 0.003*"ha" + 0.002*"year" + 0.002*"rate" + '
  '0.002*"market" + 0.001*"figure" + 0.001*"new" + 0.001*"game" + '
  '0.001*"price"'),
 (3,
  '0.007*"said" + 0.006*"wa" + 0.005*"ha" + 0.002*"year" + 0.002*"mr" + '
  '0.002*"new" + 0.002*"film" + 0.001*"people" + 0.001*"government" + '
  '0.001*"uk"'),
 (4,
  '0.006*"said" + 0.005*"wa" + 0.005*"ha" + 0.003*"mr" + 0.002*"year" + '
  '0.002*"new" + 0.002*"best" + 0.001*"game" + 0.001*"people" + 0.001*"film"'),
 (5,
  '0.008*"said" + 0.006*"wa" + 0.005*"ha" + 0.004*"mr" + 0.003*"year" + '
  '0.002*"people" + 0.002*"new" + 0.002*"say" + 0.002*"labour" + '
  '0.002*"blair"'),
 (6,
  '0.004*"wa" + 0.004*"said" + 0.004*"ha" + 0.003*"game" + 0.002*"mr" + '
  '0.002*"time" + 0.002*"people" + 0.002*"year" + 0.002*"new" + 0.001*"say"'),
 (7,
  '0.005*"said" + 0.004*"wa" + 0.002*"ha" + 0.002*"people" + 0.002*"mobile" + '
  '0.002*"phone" + 0.002*"year" + 0.001*"service" + 0.001*"new" + '
  '0.001*"firm"'),
 (8,
  '0.005*"said" + 0.004*"wa" + 0.003*"ha" + 0.002*"mr" + 0.002*"year" + '
  '0.002*"new" + 0.002*"firm" + 0.001*"people" + 0.001*"virus" + '
  '0.001*"company"'),
 (9,
  '0.005*"said" + 0.004*"wa" + 0.003*"ha" + 0.003*"people" + 0.002*"mr" + '
  '0.002*"new" + 0.002*"year" + 0.001*"uk" + 0.001*"party" + 0.001*"tv"')]
```