practical-exam-09-10

May 23, 2023

[ ]:
```
from google.colab import drive
drive.mount('/content/drive')
```

```
Drive already mounted at /content/drive; to attempt to forcibly remount, call
drive.mount("/content/drive", force_remount=True).
```

1 Problem Statement 9 and 10

Extract Sample document and apply following document preprocessing methods: Tokenization, POS Tagging, stop words removal, Stemming and Lemmatization. Create representation of document by calculating Term Frequency and Inverse Document Frequency.

[ ]:
```
import pandas as pd
```

[183]:
```
import nltk

nltk.download('stopwords')
nltk.download('punkt')
nltk.download('wordnet')
nltk.download('averaged_perceptron_tagger')

from nltk.corpus import stopwords
stopword = stopwords.words("english")
from nltk.stem import WordNetLemmatizer
from nltk.stem import SnowballStemmer
from nltk import FreqDist
import matplotlib.pyplot as plt
from wordcloud import WordCloud

# convert text to lower case
```

```
text = "A boy and a girl were playing together. The boy had a collection of␣
 ↪marbles. The girl has some sweets with her. The boy told the girl that he␣
 ↪would give her all his marbles in exchange for the sweets with her. The girl␣
 ↪agreed.The boy kept the most beautiful and the biggest marbles with him and␣
 ↪gave her the remaining marbles. The girl gave him all her sweets as she␣
 ↪promised. That night the girl slept peacefully. But the boy could not sleep␣
 ↪as he kept wondering if the girl has hidden some sweets from him the way he␣
 ↪had hidden the best marbles from her."
text = text.lower()
text
```

```
<IPython.core.display.HTML object>
```

```
[nltk_data] Downloading package stopwords to /root/nltk_data…
[nltk_data]   Package stopwords is already up-to-date!
[nltk_data] Downloading package punkt to /root/nltk_data…
[nltk_data]   Package punkt is already up-to-date!
[nltk_data] Downloading package wordnet to /root/nltk_data…
[nltk_data]   Package wordnet is already up-to-date!
[nltk_data] Downloading package averaged_perceptron_tagger to
[nltk_data]     /root/nltk_data…
[nltk_data]   Package averaged_perceptron_tagger is already up-to-
[nltk_data]       date!
```

[183]:

```
'a boy and a girl were playing together. the boy had a collection of marbles.
the girl has some sweets with her. the boy told the girl that he would give her
all his marbles in exchange for the sweets with her. the girl agreed.the boy
kept the most beautiful and the biggest marbles with him and gave her the
remaining marbles. the girl gave him all her sweets as she promised. that night
the girl slept peacefully. but the boy could not sleep as he kept wondering if
the girl has hidden some sweets from him the way he had hidden the best marbles
from her.'
```

2 Tokenization

[184]:

```
word_tokens = nltk.word_tokenize(text)
sentence_token = nltk.sent_tokenize(text)
print(word_tokens)
print ()
sentence_token
```

```
<IPython.core.display.HTML object>
```

```
['a', 'boy', 'and', 'a', 'girl', 'were', 'playing', 'together', '.', 'the',
'boy', 'had', 'a', 'collection', 'of', 'marbles', '.', 'the', 'girl', 'has',
'some', 'sweets', 'with', 'her', '.', 'the', 'boy', 'told', 'the', 'girl',
'that', 'he', 'would', 'give', 'her', 'all', 'his', 'marbles', 'in', 'exchange',
'for', 'the', 'sweets', 'with', 'her', '.', 'the', 'girl', 'agreed.the', 'boy',
'kept', 'the', 'most', 'beautiful', 'and', 'the', 'biggest', 'marbles', 'with',
'him', 'and', 'gave', 'her', 'the', 'remaining', 'marbles', '.', 'the', 'girl',
'gave', 'him', 'all', 'her', 'sweets', 'as', 'she', 'promised', '.', 'that',
'night', 'the', 'girl', 'slept', 'peacefully', '.', 'but', 'the', 'boy',
'could', 'not', 'sleep', 'as', 'he', 'kept', 'wondering', 'if', 'the', 'girl',
'has', 'hidden', 'some', 'sweets', 'from', 'him', 'the', 'way', 'he', 'had',
'hidden', 'the', 'best', 'marbles', 'from', 'her', '.']
```

[184]:

```
['a boy and a girl were playing together.',
 'the boy had a collection of marbles.',
 'the girl has some sweets with her.',
 'the boy told the girl that he would give her all his marbles in exchange for
the sweets with her.',
 'the girl agreed.the boy kept the most beautiful and the biggest marbles with
him and gave her the remaining marbles.',
 'the girl gave him all her sweets as she promised.',
 'that night the girl slept peacefully.',
 'but the boy could not sleep as he kept wondering if the girl has hidden some
sweets from him the way he had hidden the best marbles from her.']
```

3 Stopword Removal

[185]:

```python
print(stopword)
```

```
<IPython.core.display.HTML object>
```

```
['i', 'me', 'my', 'myself', 'we', 'our', 'ours', 'ourselves', 'you', "you're",
"you've", "you'll", "you'd", 'your', 'yours', 'yourself', 'yourselves', 'he',
'him', 'his', 'himself', 'she', "she's", 'her', 'hers', 'herself', 'it', "it's",
'its', 'itself', 'they', 'them', 'their', 'theirs', 'themselves', 'what',
'which', 'who', 'whom', 'this', 'that', "that'll", 'these', 'those', 'am', 'is',
'are', 'was', 'were', 'be', 'been', 'being', 'have', 'has', 'had', 'having',
'do', 'does', 'did', 'doing', 'a', 'an', 'the', 'and', 'but', 'if', 'or',
'because', 'as', 'until', 'while', 'of', 'at', 'by', 'for', 'with', 'about',
'against', 'between', 'into', 'through', 'during', 'before', 'after', 'above',
'below', 'to', 'from', 'up', 'down', 'in', 'out', 'on', 'off', 'over', 'under',
'again', 'further', 'then', 'once', 'here', 'there', 'when', 'where', 'why',
'how', 'all', 'any', 'both', 'each', 'few', 'more', 'most', 'other', 'some',
'such', 'no', 'nor', 'not', 'only', 'own', 'same', 'so', 'than', 'too', 'very',
's', 't', 'can', 'will', 'just', 'don', "don't", 'should', "should've", 'now',
'd', 'll', 'm', 'o', 're', 've', 'y', 'ain', 'aren', "aren't", 'couldn',
"couldn't", 'didn', "didn't", 'doesn', "doesn't", 'hadn', "hadn't", 'hasn',
"hasn't", 'haven', "haven't", 'isn', "isn't", 'ma', 'mightn', "mightn't",
'mustn', "mustn't", 'needn', "needn't", 'shan', "shan't", 'shouldn',
"shouldn't", 'wasn', "wasn't", 'weren', "weren't", 'won', "won't", 'wouldn',
"wouldn't"]
```

[186]:

```
removing_stopwords = [word for word in word_tokens if word not in stopword]
print(removing_stopwords)
```

```
<IPython.core.display.HTML object>
```

```
['boy', 'girl', 'playing', 'together', '.', 'boy', 'collection', 'marbles', '.',
'girl', 'sweets', '.', 'boy', 'told', 'girl', 'would', 'give', 'marbles',
'exchange', 'sweets', '.', 'girl', 'agreed.the', 'boy', 'kept', 'beautiful',
'biggest', 'marbles', 'gave', 'remaining', 'marbles', '.', 'girl', 'gave',
'sweets', 'promised', '.', 'night', 'girl', 'slept', 'peacefully', '.', 'boy',
'could', 'sleep', 'kept', 'wondering', 'girl', 'hidden', 'sweets', 'way',
'hidden', 'best', 'marbles', '.']
```

[187]:

```
words_without_punctuation = []
for word in lemmatized_word:
  if word.isalpha():
    words_without_punctuation.append(word)
print(words_without_punctuation)
```

```
<IPython.core.display.HTML object>
```

```
['boy', 'girl', 'playing', 'together', 'boy', 'collection', 'marble', 'girl',
'sweet', 'boy', 'told', 'girl', 'would', 'give', 'marble', 'exchange', 'sweet',
'girl', 'boy', 'kept', 'beautiful', 'biggest', 'marble', 'gave', 'remaining',
'marble', 'girl', 'gave', 'sweet', 'promised', 'night', 'girl', 'slept',
'peacefully', 'boy', 'could', 'sleep', 'kept', 'wondering', 'girl', 'hidden',
'sweet', 'way', 'hidden', 'best', 'marble']
```

4 Stemming and Lemmatization

[188]:

```
wordnet_lemmatizer = WordNetLemmatizer()
lemmatized_word = [wordnet_lemmatizer.lemmatize(word) for word in␣
 ↪removing_stopwords]
print(lemmatized_word)
```

```
<IPython.core.display.HTML object>
```

```
['boy', 'girl', 'playing', 'together', '.', 'boy', 'collection', 'marble', '.',
'girl', 'sweet', '.', 'boy', 'told', 'girl', 'would', 'give', 'marble',
'exchange', 'sweet', '.', 'girl', 'agreed.the', 'boy', 'kept', 'beautiful',
'biggest', 'marble', 'gave', 'remaining', 'marble', '.', 'girl', 'gave',
'sweet', 'promised', '.', 'night', 'girl', 'slept', 'peacefully', '.', 'boy',
'could', 'sleep', 'kept', 'wondering', 'girl', 'hidden', 'sweet', 'way',
'hidden', 'best', 'marble', '.']
```

In the lemmatized sentence you provided, some words have been lemmatized. For example, the word “marbles” has been lemmatized to “marble” and the word “sweets” has been lemmatized to “sweet”.

Lemmatization reduces words to their base or root form, but not all words have a different base form. For example, the word “boy” is already in its base form, so it will not change when lemmatized. Similarly, the word “playing” is the present participle of the verb “play”, but since the WordNetLemmatizer defaults to using the part of speech tag for nouns when no tag is provided, it will not be lemmatized to “play”.

In summary, some words in your sentence have been lemmatized, while others have not because they are already in their base form or because the part of speech tag was not specified.

[189]:
```
snowball_stemmer = SnowballStemmer('english')
stemmed_word = [snowball_stemmer.stem(word) for word in lemmatized_word]
print(stemmed_word)
```

```
<IPython.core.display.HTML object>
```

```
['boy', 'girl', 'play', 'togeth', '.', 'boy', 'collect', 'marbl', '.', 'girl',
'sweet', '.', 'boy', 'told', 'girl', 'would', 'give', 'marbl', 'exchang',
'sweet', '.', 'girl', 'agreed.th', 'boy', 'kept', 'beauti', 'biggest', 'marbl',
'gave', 'remain', 'marbl', '.', 'girl', 'gave', 'sweet', 'promis', '.', 'night',
'girl', 'slept', 'peac', '.', 'boy', 'could', 'sleep', 'kept', 'wonder', 'girl',
'hidden', 'sweet', 'way', 'hidden', 'best', 'marbl', '.']
```

5 POS Tagging

[190]:
```
pos_tag = nltk.pos_tag(words_without_punctuation)
print(pos_tag)
```

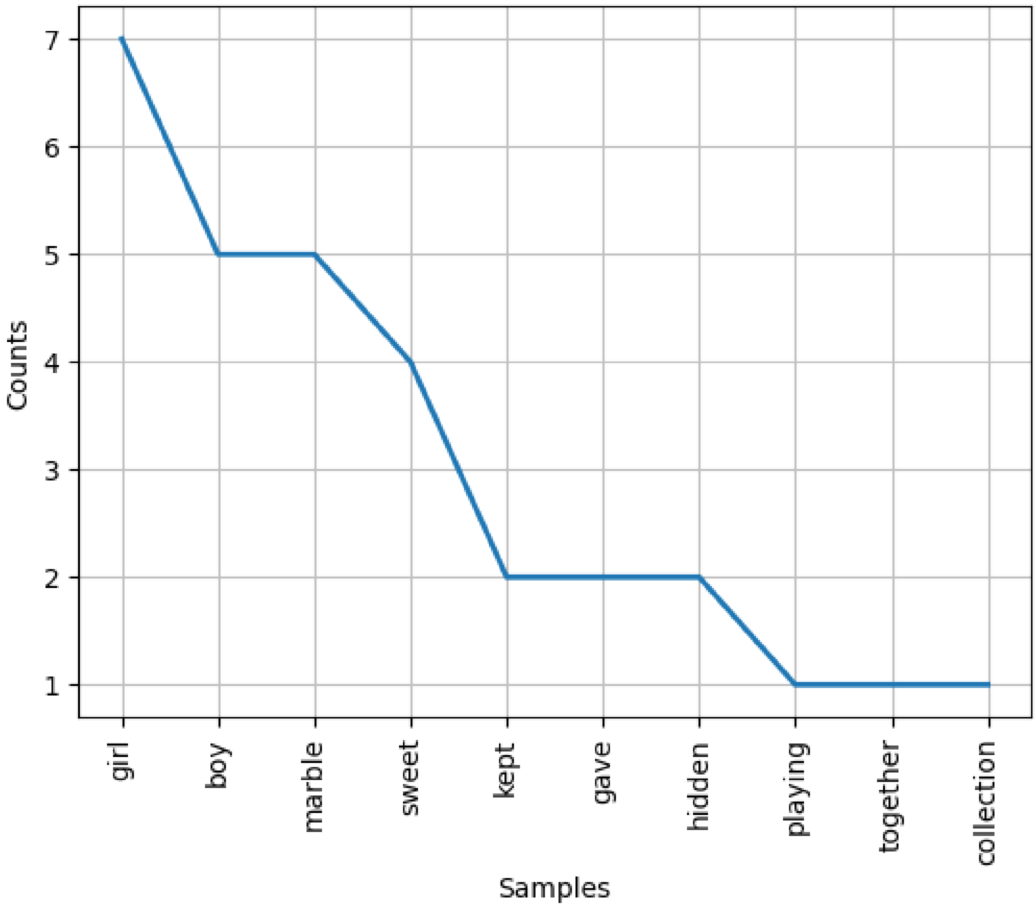
```
<IPython.core.display.HTML object>
```

```
[('boy', 'NN'), ('girl', 'NN'), ('playing', 'VBG'), ('together', 'RB'), ('boy',
'JJ'), ('collection', 'NN'), ('marble', 'JJ'), ('girl', 'JJ'), ('sweet', 'NN'),
('boy', 'NN'), ('told', 'VBD'), ('girl', 'NN'), ('would', 'MD'), ('give', 'VB'),
('marble', 'JJ'), ('exchange', 'NN'), ('sweet', 'JJ'), ('girl', 'NN'), ('boy',
'NN'), ('kept', 'VBD'), ('beautiful', 'JJ'), ('biggest', 'JJS'), ('marble',
'JJ'), ('gave', 'VBD'), ('remaining', 'VBG'), ('marble', 'JJ'), ('girl', 'NNS'),
('gave', 'VBD'), ('sweet', 'NN'), ('promised', 'JJ'), ('night', 'NN'), ('girl',
'NN'), ('slept', 'VBD'), ('peacefully', 'RB'), ('boy', 'VBN'), ('could', 'MD'),
('sleep', 'VB'), ('kept', 'VBD'), ('wondering', 'VBG'), ('girl', 'JJ'),
('hidden', 'JJ'), ('sweet', 'JJ'), ('way', 'NN'), ('hidden', 'JJ'), ('best',
'RBS'), ('marble', 'JJ')]
```

6 Representation

[191]:
```
freq = FreqDist(words_without_punctuation)
freq.plot(10)
```

```
<IPython.core.display.HTML object>
```



```
[191]: <Axes: xlabel='Samples', ylabel='Counts'>
```

7 Term Frequency-Inverse Document Frequency

```
[192]: from sklearn.feature_extraction.text import TfidfVectorizer

corpus = sentence_token

# Create an instance of TfidfVectorizer
vectorizer = TfidfVectorizer()

# Fit and transform the corpus
tfidf_matrix = vectorizer.fit_transform(corpus)

# Get the feature names
feature_names = vectorizer.get_feature_names_out()
```

```python
# Print the feature names and their TF-IDF values for each document
for doc_index, doc in enumerate(corpus):
    print()
    print(f"Document {doc_index}: {doc}")
    for feature_index, feature_name in enumerate(feature_names):
        tfidf_value = tfidf_matrix[doc_index, feature_index]
        if tfidf_value > 0:
            print(f"  {feature_name}: {tfidf_value}")
```

```
<IPython.core.display.HTML object>


Document 0: a boy and a girl were playing together.
  and: 0.40813158848235204
  boy: 0.27333048139766297
  girl: 0.217382967013214
  playing: 0.48698518118259204
  together: 0.48698518118259204
  were: 0.48698518118259204

Document 1: the boy had a collection of marbles.
  boy: 0.29504957196591153
  collection: 0.5256814700173216
  had: 0.44056209856920525
  marbles: 0.333324372942383
  of: 0.5256814700173216
  the: 0.2346564168107343

Document 2: the girl has some sweets with her.
  girl: 0.25587811588090575
  has: 0.4804053570857617
  her: 0.3217330665497982
  some: 0.4804053570857617
  sweets: 0.3634693382132125
  the: 0.25587811588090575
  with: 0.4145504064168692

Document 3: the boy told the girl that he would give her all his marbles in
exchange for the sweets with her.
  all: 0.22397002952533965
  boy: 0.1499953390435913
  exchange: 0.2672424494596166
  for: 0.2672424494596166
  girl: 0.11929306849611998
  give: 0.2672424494596166
  he: 0.22397002952533965
  her: 0.2999906780871826
  his: 0.2672424494596166
  in: 0.2672424494596166
  marbles: 0.1694532278011968
  sweets: 0.1694532278011968
  that: 0.22397002952533965
  the: 0.35787920548835994
  told: 0.2672424494596166
  with: 0.1932677589778683
  would: 0.2672424494596166

Document 4: the girl agreed.the boy kept the most beautiful and the biggest
marbles with him and gave her the remaining marbles.
  agreed: 0.23783046459255194
  and: 0.3986409815097009
  beautiful: 0.23783046459255194
  biggest: 0.23783046459255194
  boy: 0.13348725564965055
  gave: 0.19932049075485045
  girl: 0.10616399438215221
  her: 0.13348725564965055
  him: 0.17199722948735208
  kept: 0.19932049075485045
  marbles: 0.3016073230593265
  most: 0.23783046459255194
  remaining: 0.23783046459255194
  the: 0.5308199719107611
  with: 0.17199722948735208

Document 5: the girl gave him all her sweets as she promised.
  all: 0.3496324207621926
  as: 0.3496324207621926
  gave: 0.3496324207621926
  girl: 0.1862245783815
  her: 0.2341529069938498
  him: 0.3017040921498428
  promised: 0.41718360591818554
  she: 0.41718360591818554
  sweets: 0.26452799228388124
  the: 0.1862245783815

Document 6: that night the girl slept peacefully.
  girl: 0.22042988811198885
  night: 0.4938109479099628
  peacefully: 0.4938109479099628
  slept: 0.4938109479099628
  that: 0.41385211371535147
  the: 0.22042988811198885

Document 7: but the boy could not sleep as he kept wondering if the girl has
```

```
hidden some sweets from him the way he had hidden the best marbles from her.
  as: 0.15933514395692747
  best: 0.1901196970250538
  boy: 0.10670860288775738
  but: 0.1901196970250538
  could: 0.1901196970250538
  from: 0.3802393940501076
  girl: 0.08486661488671365
  had: 0.15933514395692747
  has: 0.15933514395692747
  he: 0.31867028791385493
  her: 0.10670860288775738
  hidden: 0.3802393940501076
  him: 0.13749315595588374
  if: 0.1901196970250538
  kept: 0.15933514395692747
  marbles: 0.12055119384897428
  not: 0.1901196970250538
  sleep: 0.1901196970250538
  some: 0.15933514395692747
  sweets: 0.12055119384897428
  the: 0.3394664595468546
  way: 0.1901196970250538
  wondering: 0.1901196970250538
```

[ ]: