

Tokenization

Tokenization breaks the raw text into words, sentences called tokens. These tokens help in understanding the context or developing the model for the NLP. ... If the text is split into words using some separation technique it is called word tokenization and same separation done for sentences is called sentence tokenization.

NLTK

```
import nltk
nltk.download('punkt')
paragraph = "write paragraph here to convert into tokens."
sentences = nltk.sent_tokenize(paragraph)
words = nltk.word_tokenize(paragraph)
```

Spacy

```
from spacy.lang.en import English
nlp = English()
sbd = nlp.create_pipe('sentencizer')
nlp.add_pipe(sbd)
doc = nlp(paragraph)
[sent for sent in doc.sents]
nlp = English()
doc = nlp(paragraph)
```

Tokenization (cont)

```
> [word for word in doc]
# Keras
from keras.preprocessing.text import text_to_word_sequence
text_to_word_sequence(paragraph)
# gensim
from gensim.summarization.textcleaner import split_sentences
split_sentences(paragraph)
from gensim.utils import tokenize
list(tokenize(paragraph))
```

Bag Of Words & TF-IDF

Bag of Words model is used to preprocess the text by converting it into a bag of words, which keeps a count of the total occurrences of most frequently used words

counters = List of sentences after preprocessing like tokenization, stemming/lemmatization, stopwords

```
from sklearn.feature_extraction.text import CountVectorizer
cv = CountVectorizer(max_features=1500)
```

Bag Of Words & TF-IDF (cont)

```
> X = cv.fit_transform(counters).toarray()
Term Frequency-Inverse Document Frequency (TF-IDF):
Term frequency-inverse document frequency, is a numerical statistic that is intended to reflect how important a word is to a document in a collection or corpus.
T.F = No of rep of words in sentence / No of words in sentence
IDF = No of sentences / No of sentences containing words
from sklearn.feature_extraction.text import TfidfVectorizer
cv = TfidfVectorizer()
X = cv.fit_transform(counters).toarray()
N-gram Language Model: An N-gram is a sequence of N tokens (or words).
A 1-gram (or unigram) is a one-word sequence. the unigrams would simply be: "I", "love", "reading", "blogs", "about", "data", "science", "on", "Analytics", "Vidhya".
```

Bag Of Words & TF-IDF (cont)

> A 2-gram (or bigram) is a two-word sequence of words, like "I love", "love reading", or "Analytics Vidhya".

And a 3-gram (or trigram) is a three-word sequence of words like "I love reading", "about data science" or "on Analytics Vidhya".

Stemming & Lemmatization

From Stemming we will process of getting the root form of a word. We would create the stem words by removing the prefix or suffix of a word. So, stemming a word may not result in actual words.

```
paragraph = " "
# NLTK
from nltk.stem import PorterStemmer
from nltk import sent_tokenize
from nltk import word_tokenize
stem = PorterStemmer()
sentence = sent_tokenize(paragraph)[1]
words = word_tokenize(sentence)
[stem.stem(word) for word in words]
# Spacy
```

Stemming & Lemmatization (cont)

```
> No Stemming in spacy
# Keras
No Stemming in Keras
Lemmatization:
As stemming, lemmatization do the same but the only difference is that lemmatization ensures that root word belongs to the language
# NLTK
from nltk.stem import WordNetLemmatizer
lemma = WordNetLemmatizer()
sentence = sent_tokenize(paragraph)[1]
words = word_tokenize(sentence)
[lemma.lemmatize(word) for word in words]
# Spacy
import spacy as spacy
sp = spacy.load('en_core_web_sm')
ch = sp(u'warning warned')
for x in ch:
    print(ch.lemma_)
# Keras
No lemmatization or stemming
```

Word2Vec

In BOW and TF-IDF approach semantic information not stored. TF-IDF gives importance to uncommon words. There is definitely chance of overfitting.

In W2v each word is basically represented as a vector of 32 or more dimension instead of a single number. Here the semantic information and relation between words is also preserved.

Steps:

1. Tokenization of the sentences
2. Create Histograms
3. Take most frequent words
4. Create a matrix with all the unique words. It also represents the occurrence relation between the words

```
from gensim.models import Word2Vec
model = Word2Vec(sentences, min_count=1)
words = model.wv.vocab
vector = model.wv['freedom']
similar = model.wv.most_similar(['freedom'])
```

Stop Words

Stopwords are the most common words in any natural language. For the purpose of analyzing text data and building NLP models, these stopwords might not add much value to the meaning of the document.

NLTK

```
from nltk.corpus import stopwords
from nltk.tokenize import word_tokenize
stopwords = set(stopwords.words('english'))
word_tokens = word_tokenize('The cat sat on the mat.')
[word for word in word_tokens if word not in stopwords]
# Spacy
from spacy.lang.en import English
from spacy.lang.en.nlp import STOP_WORDS
nlp = English()
my_doc = nlp('The cat sat on the mat.')
# Create list of word tokens
token_list = [token.text for token in my_doc]
# Create list of word tokens after removing stopwords
filtered_sentence = []
```

Stop Words (cont)

```
> for word in token_list:
    lexeme = nlp.vocab[word]
    if lexeme.is_stop == False:
        filtered_sentence.append(word)
# Gensim
from gensim.parsing.preprocessing import remove_stopwords
remove_stopwords(paragraph)
```

Tokenization

NLTK Spacy Keras Tensorflow

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Parts of Speech (POS) Tagging, Chunking & NER

The pos (parts of speech) explain you how a word is used in a sentence. In the sentence, a word have different contexts and semantic meanings. The basic natural language processing (NLP) models like bag-of-words (bow) fails to identify these relationship between the words. For that we use pos tagging to mark a word to its pos tag based on its context in the data. Pos is also used to extract relationship between the words

NLTK

Parts of Speech (POS) Tagging, Chunking & NER (cont)

```
> from nltk.tokenize import
word_tokenize
from nltk import pos_tag
nltk.download('averaged_per-
ceptron_tagger')
word_tokens = word_tokeniz-
e('Are you afraid of something?')
pos_tag(word_tokens)
# Spacy
nlp = spacy.load("en_core_we-
b_sm")
doc = nlp("Coronavirus: Delhi
resident tests positive for
coronavirus, total 31 people
infected in India")
[token.pos_ for token in doc]
Chunking:
Chunking is the process of
extracting phrases from the
Unstructured text and give them
more structure to it. We also
called them shallow parsing. We
can do it on top of pos tagging. It
groups words into chunks mainly
for noun phrases. chunking we
do by using regular expression.
# NLTK
word_tokens = word_tokeniz-
e(text)
```

Parts of Speech (POS) Tagging, Chunking & NER (cont)

```
> word_pos = pos_tag(word_to-
kens)
chunkParser = nltk.RegexpPars-
er(grammar)
tree = chunkParser.parse(wor-
d_pos)
Named Entity Recognition:
It is used to extract information
from unstructured text. It is used
to classify the entities which is
present in the text into
categories like a person, organi-
zation, event, places, etc. This
will give you a detail knowledge
about the text and the relati-
onship between the different
entities.
# Spacy
import spacy
nlp = spacy.load("en_core_we-
b_sm")
doc = nlp("Coronavirus: Delhi
resident tests positive for
coronavirus, total 31 people
infected in India")
for ent in doc.ents:
    print(ent.text, ent.start_char,
ent.end_char, ent.label_)
```