Experiment No.4
Apply Stemming on the given Text input
Date of Performance:
Date of Submission:

Aim: Apply Stemming on the given Text input.

Objective: Understand the working of stemming algorithms and apply stemming on the given input text.

Theory:

Stemming is a process of linguistic normalization, which reduces words to their word root word or chops off the derivational affixes. For example, connection, connected, connecting word reduce to a common word "conect".

Stemming is the process of producing morphological variants of a root/base word. Stemming programs are commonly referred to as stemming algorithms or stemmers. A stemming algorithm reduces the words “chocolates”, “chocolatey”, “choco” to the root word, “chocolate” and “retrieval”, “retrieved”, “retrieves” and reduces to the stem “retrieve”. Stemming is an important part of the pipelining process in Natural language processing. The input to the stemmer is tokenized words.

Applications of stemming :

1. Stemming is used in information retrieval systems like search engines.
2. It is used to determine domain vocabularies in domain analysis.

Porter’s Stemmer Algorithm:

It is one of the most popular stemming methods proposed in 1980. It is based on the idea that the suffixes in the English language are made up of a combination of smaller and simpler suffixes. This stemmer is known for its speed and simplicity. The main applications of Porter Stemmer include data mining and Information retrieval. However, its applications are only limited to English words. Also, the group of stems is mapped on to the same stem and the output stem is not necessarily a meaningful word. The algorithms are fairly lengthy in nature and are known to be the oldest stemmer.

Example: EED -> EE means "if the word has at least one vowel and consonant plus EED ending, change the ending to EE" as 'agreed' becomes 'agree'.

Advantage: It produces the best output as compared to other stemmers and it has less error rate.

Limitation: Morphological variants produced are not always real words.

Library required

```
!pip install nltk
```

```
Requirement already satisfied: nltk in /usr/local/lib/python3.10/dist-packages (3.8.1)
Requirement already satisfied: click in /usr/local/lib/python3.10/dist-packages (from nltk) (8.1.7)
Requirement already satisfied: joblib in /usr/local/lib/python3.10/dist-packages (from nltk) (1.3.2)
Requirement already satisfied: regex>=2021.8.3 in /usr/local/lib/python3.10/dist-packages (from nltk) (2023.6.3)
Requirement already satisfied: tqdm in /usr/local/lib/python3.10/dist-packages (from nltk) (4.66.1)
```

Text

```
text = 'NGC 7319 is a highly active, blue-shifted emission-line galaxy and Seyfert Type 2 object situated in the Pegasus constellation, not f
```

```
text
```

```
'NGC 7319 is a highly active, blue-shifted emission-line galaxy and Seyfert Type 2 object situated in the Pegasus constellation, not fa
r from the conjunction of Equuleus and Lacerta. Its estimated co-moving distance is about 280 million light-years away from our plane
t '
```

Stopwords

```
import nltk
from nltk.corpus import stopwords
nltk.download('stopwords')
```

```
[nltk_data] Downloading package stopwords to /root/nltk_data...
[nltk_data]   Unzipping corpora/stopwords.zip.
True
```

```
stop_words = stopwords.words('english')
```

```
from nltk.tokenize import word_tokenize
nltk.download('punkt')
words = word_tokenize(text)
```

```
[nltk_data] Downloading package punkt to /root/nltk_data...
[nltk_data]   Unzipping tokenizers/punkt.zip.
```

Applying stop words

```
holder = list()
for w in words:
    if w not in set(stop_words):
        holder.append(w)
```

```
holder
```

```
['NGC',
 '7319',
 'highly',
 'active',
 ',',
 'blue-shifted',
 'emission-line',
 'galaxy',
 'Seyfert',
 'Type',
 '2',
 'object',
 'situated',
 'Pegasus',
 'constellation',
 ',',
 'far',
```

```
 'conjunction',
 'Equuleus',
 'Lacerta',
 '.',
 'Its',
 'estimated',
 'co-moving',
 'distance',
 '280',
 'million',
 'light-years',
 'away',
 'planet',
 '.']
```

▾ List Comprehension for stop words

```
holder = [w for w in words if w not in set(stop_words)]
print(holder)
```

```
['NGC', '7319', 'highly', 'active', ',', 'blue-shifted', 'emission-line', 'galaxy', 'Seyfert', 'Type', '2', 'object', 'situated', 'Pegas
```

▾ Stemming

```
from nltk.stem import PorterStemmer, SnowballStemmer, LancasterStemmer

porter = PorterStemmer()
snow = SnowballStemmer(language = 'english')
lancaster = LancasterStemmer()

words = ['play', 'plays', 'played', 'playing', 'player']
```

▾ Porter Stemmer

```
porter_stemmed = list()
for w in words:
    stemmed_words = porter.stem(w)
    porter_stemmed.append(stemmed_words)

porter_stemmed
```

```
['play', 'play', 'play', 'play', 'player']
```

▾ Porter Stemmer List Comprehension

```
porter_stemmed = [porter.stem(x) for x in words]
print (porter_stemmed)
```

```
['play', 'play', 'play', 'play', 'player']
```

▾ Snowball Stemmer

```
snow_stemmed = list()
for w in words:
    stemmed_words = snow.stem(w)
    snow_stemmed.append(stemmed_words)

snow_stemmed
```

```
['play', 'play', 'play', 'play', 'player']
```

▾ Snowball Stemmer List Comprehension

```
snow_stemmed = [snow.stem(x) for x in words]
print (snow_stemmed)
```

```
['play', 'play', 'play', 'play', 'player']
```

▾ Lancaster Stemmer

```
lancaster_stemmed = list()
for w in words:
    stemmed_words = lancaster.stem(w)
    lancaster_stemmed.append(stemmed_words)
```

```
lancaster_stemmed
```

```
['play', 'play', 'play', 'play', 'play']
```

▾ Lancaster Stemmer List Comprehension

```
lancaster_stemmed = [lancaster.stem(x) for x in words]
print (lancaster_stemmed)
```

```
['play', 'play', 'play', 'play', 'play']
```

▾ Lemmatization : This has a more expansive vocabulary than Stemming

```
from nltk.stem import WordNetLemmatizer
wordnet = WordNetLemmatizer()
```

```
nltk.download('wordnet')
lemmatized = [wordnet.lemmatize(x) for x in words]
```

```
[nltk_data] Downloading package wordnet to /root/nltk_data...
```

```
lemmatized
```

```
['play', 'play', 'played', 'playing', 'player']
```

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Conclusion:

Comment on the implementation of stemming for an Indian language. Comment on the implementation of stemming for English (Explain which rules have been applied for identifying the stem words in your output).

Implementing stemming for an Indian language involves using language-specific rules or algorithms to reduce inflected or derived words to their root or base form. Stemming in Indian languages faces unique challenges due to the rich morphological complexity of these languages, with various tenses, gender, and conjugations. This requires the development of custom stemming algorithms or leveraging existing libraries that are tailored to specific languages. Additionally, the quality and accuracy of stemming can vary significantly between different Indian languages, emphasizing the need for careful language-specific implementation and evaluation.