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Batch: A

Experiment 1

Aim:

1. Install NLTK and perform basic Corpus analysis using NLTK such as frequency distribution
2. Learn about morphological features of a word by analysing it.

1. Installig NLTK and downloading the required corpus

In [ ]:
```
import nltk
from nltk import FreqDist
from nltk.tokenize import word_tokenize, sent_tokenize
from nltk.tag import pos_tag
from nltk.stem import WordNetLemmatizer
from nltk.corpus import wordnet
from prettytable import PrettyTable
```

In [ ]:
```
nltk.download("punkt")
nltk.download("averaged_perceptron_tagger")
nltk.download("wordnet")
```

```
[nltk_data] Downloading package punkt to
[nltk_data]     C:\Users\hatim\AppData\Roaming\nltk_data...
[nltk_data]   Unzipping tokenizers\punkt.zip.
[nltk_data] Downloading package averaged_perceptron_tagger to
[nltk_data]     C:\Users\hatim\AppData\Roaming\nltk_data...
[nltk_data]   Unzipping taggers\averaged_perceptron_tagger.zip.
[nltk_data] Downloading package wordnet to
[nltk_data]     C:\Users\hatim\AppData\Roaming\nltk_data...
```

Out[ ]: True

2. Morphological analysis of a words

In [ ]:
```
pos_mapping = {
    "CC": "Coordinating conjunction",
    "CD": "Cardinal number",
    "DT": "Determiner",
    "EX": "Existential there",
    "FW": "Foreign word",
    "IN": "Preposition or subordinating conjunction",
    "JJ": "Adjective",
    "JJR": "Adjective, comparative",
    "JJS": "Adjective, superlative",
```

```
    "LS": "List item marker",
    "MD": "Modal",
    "NN": "noun, singular or mass",
    "NNS": "noun, plural",
    "NNP": "Proper noun, singular",
    "NNPS": "Proper noun, plural",
    "PDT": "Predeterminer",
    "POS": "Possessive ending",
    "PRP": "Personal pronoun",
    "PRP$": "Possessive pronoun",
    "RB": "Adverb",
    "RBR": "Adverb, comparative",
    "RBS": "Adverb, superlative",
    "RP": "Particle",
    "SYM": "Symbol",
    "TO": "to",
    "UH": "Interjection",
    "VB": "Verb, base form",
    "VBD": "Verb, past tense",
    "VBG": "Verb, gerund or present participle",
    "VBN": "Verb, past participle",
    "VBP": "Verb, non3rd person singular present",
    "VBZ": "Verb, 3rd person singular present",
    "WDT": "Whdeterminer",
    "WP": "Whpronoun",
    "WP$": "Possessive whpronoun",
    "WRB": "Whadverb",
}

def get_wordnet_pos(tag):
    if tag.startswith("N"):
        return wordnet.NOUN
    elif tag.startswith("V"):
        return wordnet.VERB
    elif tag.startswith("R"):
        return wordnet.ADV
    elif tag.startswith("J"):
        return wordnet.ADJ
    else:
        return wordnet.NOUN

def get_category(tag):
    if tag.startswith("N"):
        return "Noun"
    elif tag.startswith("V"):
        return "Verb"
    elif tag.startswith("R"):
        return "Adverb"
    elif tag.startswith("J"):
        return "Adjective"
    else:
        return "Noun"
```

In [ ]:

```
def analyze_sentence(sentence):
    words = word_tokenize(sentence)
    tags = pos_tag(words)
```

```
    maleWords = ["he", "him", "his", "himself", "boy", "sir", "man"]
    femaleWords = ["she", "her", "hers", "hersef", "girl", "madam", "lady"]
    lemmatizer = WordNetLemmatizer()
    morphological_table = PrettyTable()
    morphological_table.field_names = ["Root", "Category", "Gender", "Number", "Ten
    print(f"\nSentence: {sentence}")
    for i in range(len(words)):
        root = lemmatizer.lemmatize(words[i], get_wordnet_pos(tags[i][1]))
        category = pos_mapping[tags[i][1]] if tags[i][1] in pos_mapping else tags[i
        if words[i].lower() in maleWords:
            gender = "male"
        elif words[i].lower() in femaleWords:
            gender = "female"
        # check if word is a pronoun
        elif "noun" in category and (words[i].endswith("i") or words[i].endswith("a
            gender = "female"
        elif "noun" in category:
            gender = "male"
        else:
            gender = "neutral"
        # find frequency of word in corpus
        number = sentence.count(words[i])

        # check if word is a verb
        if tags[i][1].startswith("V"):
            # determine tense of the verb
            if (
                words[i].endswith("ed")
                or words[i - 1].lower() == "had"
                or words[i - 1].lower() == "was"
                or words[i - 1].lower() == "were"
            ):
                tense = "past"
            elif (
                words[i].endswith("ing")
                or words[i].endswith("s")
                or words[i - 1].lower() == "is"
                or words[i - 1].lower() == "are"
            ):
                tense = "present"
            elif words[i - 1].lower() == "will" or words[i - 1].lower() == "shall":
                tense = "future"
            else:
                tense = "present"
        else:
            tense = "NA"

        # print(f"Root: {root}, Category: {category}, Gender: {gender}, Number: {nu
        morphological_table.add_row([root, category, gender, number, tense])
    print(morphological_table)
```

3. Reading a text file and Tokenization

In [ ]:
```
# read input file
with open("input.txt", "r") as f:
```

```
    text = f.read()

# tokenise sentences
sentences = sent_tokenize(text)
```

In [ ]:

```
# Analyze each sentence
for sentence in sentences:
    analyze_sentence(sentence)
```

Sentence: The quick brown fox jumps over The lazy dog.

Root	Category	Gender	Number	Tense
The	Determiner	neutral	2	NA
quick	Adjective	neutral	1	NA
brown	noun, singular or mass	male	1	NA
fox	noun, singular or mass	male	1	NA
jump	Verb, 3rd person singular present	neutral	1	present
over	Preposition or subordinating conjunction	neutral	1	NA
The	Determiner	neutral	2	NA
lazy	Adjective	neutral	1	NA
dog	noun, singular or mass	male	1	NA
.	.	neutral	1	NA

Sentence: She plays The piano beautifully.

Root	Category	Gender	Number	Tense
She	Personal pronoun	female	1	NA
play	Verb, 3rd person singular present	neutral	1	present
The	Determiner	neutral	1	NA
piano	noun, singular or mass	male	1	NA
beautifully	Adverb	neutral	1	NA
.	.	neutral	1	NA

Sentence: The sun sets in The west every evening.

Root	Category	Gender	Number	Tense
The	Determiner	neutral	2	NA
sun	noun, singular or mass	male	1	NA
set	noun, plural	male	1	NA
in	Preposition or subordinating conjunction	neutral	2	NA
The	Determiner	neutral	2	NA
west	noun, singular or mass	male	1	NA
every	Determiner	neutral	1	NA
evening	noun, singular or mass	male	1	NA
.	.	neutral	1	NA

Sentence: John and Mary are going to The beach tomorrow.

Root	Category	Gender	Number	Tense
John	Proper noun, singular	male	1	NA
and	Coordinating conjunction	neutral	1	NA
Mary	Proper noun, singular	male	1	NA
be	Verb, non3rd person singular present	neutral	1	present
go	Verb, gerund or present participle	neutral	1	present
to	to	neutral	2	NA
The	Determiner	neutral	1	NA
beach	noun, singular or mass	male	1	NA
tomorrow	noun, singular or mass	male	1	NA

.	.	neutral	1	NA

Sentence: The delicious aroma of freshly baked bread fills The air.

Root	Category	Gender	Number	Tense
The	Determiner	neutral	2	NA
delicious	Adjective	neutral	1	NA
aroma	noun, singular or mass	female	1	NA
of	Preposition or subordinating conjunction	neutral	1	NA
freshly	Adjective	neutral	1	NA
bake	Verb, past participle	neutral	1	past
bread	noun, singular or mass	male	1	NA
fill	Verb, 3rd person singular present	neutral	1	present
The	Determiner	neutral	2	NA
air	noun, singular or mass	male	1	NA
.	.	neutral	1	NA

Sentence: The old library is a quiet and peaceful place.

Root	Category	Gender	Number	Tense
The	Determiner	neutral	1	NA
old	Adjective	neutral	1	NA
library	noun, singular or mass	male	1	NA
be	Verb, 3rd person singular present	neutral	1	present
a	Determiner	neutral	5	NA
quiet	Adjective	neutral	1	NA
and	Coordinating conjunction	neutral	1	NA
peaceful	Adjective	neutral	1	NA
place	noun, singular or mass	male	1	NA
.	.	neutral	1	NA

Sentence: The students eagerly await The results of their exams.

Root	Category	Gender	Number	Tense
The	Determiner	neutral	2	NA

student	noun, plural	male	1	NA
eagerly	Adverb	neutral	1	NA
await	Verb, non3rd person singular present	neutral	1	present
The	Determiner	neutral	2	NA
result	noun, plural	male	1	NA
of	Preposition or subordinating conjunction	neutral	1	NA
their	Possessive pronoun	male	1	NA
exam	noun, plural	male	1	NA
.	.	neutral	1	NA

Sentence: The majestic mountain range is covered in snow.

Root	Category	Gender	Number	Tense
The	Determiner	neutral	1	NA
majestic	Adjective	neutral	1	NA
mountain	noun, singular or mass	male	1	NA
range	noun, singular or mass	male	1	NA
be	Verb, 3rd person singular present	neutral	1	present
cover	Verb, past participle	neutral	1	past
in	Preposition or subordinating conjunction	neutral	2	NA
snow	noun, singular or mass	male	1	NA
.	.	neutral	1	NA

Sentence: The cat chased The playful mouse around The room.

Root	Category	Gender	Number	Tense
The	Determiner	neutral	3	NA
cat	noun, singular or mass	male	1	NA
chase	Verb, past tense	neutral	1	past
The	Determiner	neutral	3	NA
playful	Adjective	neutral	1	NA
mouse	noun, singular or mass	male	1	NA
around	Preposition or subordinating conjunction	neutral	1	NA
The	Determiner	neutral	3	NA
room	noun, singular or mass	male	1	NA
.	.	neutral	1	NA

Sentence: We enjoyed a relaxing vacation on The tropical island.

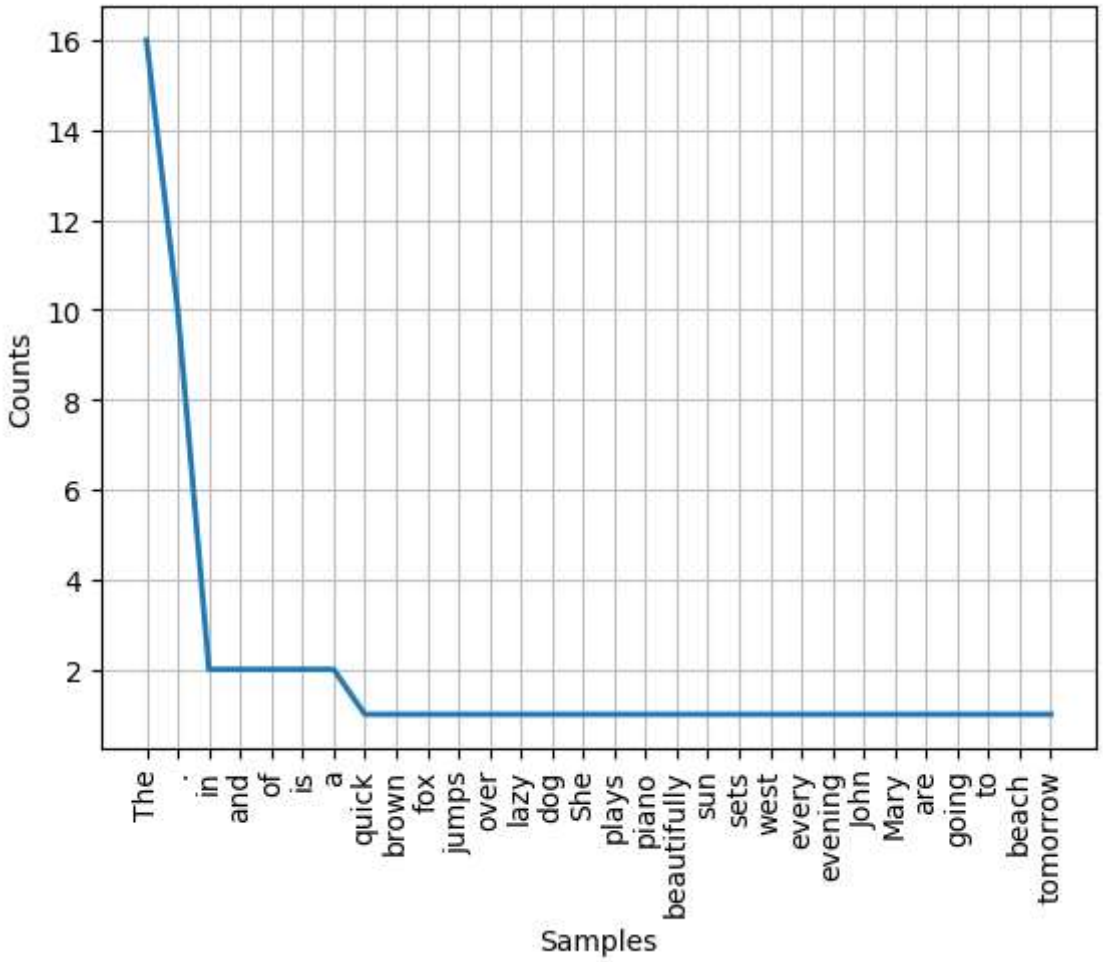
Root	Category	Gender	Number	Tense
We	Personal pronoun	male	1	NA
enjoy	Verb, past tense	neutral	1	past
a	Determiner	neutral	6	NA
relaxing	Adjective	neutral	1	NA
vacation	noun, singular or mass	male	1	NA
on	Preposition or subordinating conjunction	neutral	2	NA
The	Determiner	neutral	1	NA
tropical	Adjective	neutral	1	NA
island	noun, singular or mass	male	1	NA

```
|    .     |                    .                    | neutral |   1    |   NA  |
+----------+-----------------------------------------+---------+--------+-------+
```

4. Performing frequency distribution on the tokens

In [ ]:
```
tokens = word_tokenize(text)
fdist = FreqDist(tokens)
freq_table = fdist.tabulate()
# Display frequency distribution as a bar graph
fdist.plot(30, cumulative=False)
```

```
       The           .          in         and          of          is           a
quick       brown         fox       jumps        over        lazy         dog
She       plays       piano beautifully         sun        sets        west       ev
ery     evening        John        Mary         are       going          to       be
ach    tomorrow   delicious       aroma     freshly       baked       bread       fi
lls         air         old     library       quiet    peaceful       place    stude
nts     eagerly       await     results       their       exams    majestic    mount
ain       range     covered        snow         cat      chased     playful       mo
use      around        room          We     enjoyed    relaxing    vacation
on    tropical      island
         16          10           2           2           2           2           2
1           1           1           1           1           1           1
1           1           1           1           1           1           1
1           1           1           1           1           1           1
1           1           1           1           1           1           1
1           1           1           1           1           1           1
1           1           1           1           1           1           1
1           1           1           1           1           1           1
1           1           1           1           1           1           1
1           1           1
```



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

5. Conclusion

In this experiment we learnt about the basic corpus analysis using NLTK and also learnt about the morphological features of a word. We also learnt about the tokenization of a text file and performing frequency distribution on the tokens.