GOKHALE EDUCATION SOCIETY'S

N. B. MEHTA (V) SCIENCE COLLEGE

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DEPARTMENT OF INFORMATION TECHNOLOGY AND COMPUTER SCIENCE

Certificate

Class _____ Year _____

This is to certify that the work entered in this journal is the work of Shri/Kumari _____

Of _____ division_____ Roll No. _____

Uni. Exam No. _____ has satisfactorily completed the required University of Mumbai Practicals on Subject PSCSP202: Natural Language Processing and worked for the Master of Computer Science 1st term / 2nd term/ both the terms of the Year _____ in the college laboratory as laid down by the university.

_____	_____	_____
Head of the Department	External Examiner	Internal Examiner Subject teacher

Date: / / 2023 Department of IT-CS

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Practical No. 1

Aim: Write a program to implement sentence segmentation and word tokenization.

Code :

```
#sentence_segmentation
from nltk.tokenize import sent_tokenize
text = "God is Great! I won a lottery."
print("sentence_segmentation : ", sent_tokenize(text))

#word_tokenize

from nltk.tokenize import word_tokenize
text = "God is Great! I won a lottery. word_tokenize "
print("word_tokenize: ", (word_tokenize(text))
```

Output:

```
sentence_segmentation: ['God is Great!', 'I won a lottery ']
word_tokenize :  ['God', 'is', 'Great', '!', 'I', 'won', 'a', 'lottery', '.']
```

Practical No. 2

Aim: Write a program to implement stemming and lemmatization

Stemming:

- Stemming is the process of removing prefixes and suffixes from words to obtain their root form, called the stem.
- It is a rule-based approach that applies heuristics to chop off common word endings.
- Stemming algorithms may not produce actual dictionary words as stems, but they aim to find the common base form of related words.

Lemmatization:

- Lemmatization is the process of reducing words to their base or dictionary form, called the lemma.
- It takes into account the part of speech (POS) of the word and applies morphological analysis to determine the lemma.
- Lemmatization produces valid words that can be found in a dictionary.

Code:

Stemming Code:

```
import nltk
from nltk.stem.porter import PorterStemmer
porter_stemmer  = PorterStemmer()
text = "studies studying cries cry"
tokenization = nltk.word_tokenize(text)
for w in tokenization:
print("Stemming for {} is {}".format(w,porter_stemmer.stem(w)))
```

Lemmatization Code:

```
importnltk
fromnltk.stem import WordNetLemmatizer
wordnet_lemmatizer = WordNetLemmatizer()
text = "studies studying cries cry"
tokenization = nltk.word_tokenize(text)
for w in tokenization:
```

```
print("Lemma for {} is {}".format(w,wordnet_lemmatizer.lemmatize(w)))
```

Output:

```
Stemming for studies is studi
Stemming for studying is studi
Stemming for cries is cri
Stemming for cry is cri

Lemma for studies is study
Lemma for studying is studying
Lemma for cries is cry
Lemma for cry is cry
```

Practical No. 3

Aim: Write a program to implement a tri-gram model

- An n-gram is a contiguous sequence of n items, which can be words, characters, or even phonemes. In the context of natural language processing (NLP), an n-gram typically refers to a sequence of n words.

For example:

- A unigram (1-gram) represents a single word. Example: "cat"
- A bigram (2-gram) represents a sequence of two consecutive words. Example: "the cat"
- A trigram (3-gram) represents a sequence of three consecutive words. Example: "the quick brown"
- And so on...

Code:

```
from nltk.util import ngrams

n = 3

sentence = 'Whoever is happy will make others happy too'

unigrams = ngrams(sentence.split(), n)

for item in unigrams:

print(item)
```

Output:

```
('Whoever', 'is', 'happy')

('is', 'happy', 'will')

('happy', 'will', 'make')

('will', 'make', 'others')

('make', 'others', 'happy')

('others', 'happy', 'too')
```

Practical No. 4

Aim: Write a program to implement PoS tagging using hmm and neural model.

Code:

```
importnltk
importnumpy as np
fromsklearn.model_selection import train_test_split
fromsklearn.metrics import accuracy_score
fromnltk.tag import HiddenMarkovModelTrainer
fromnltk.corpus import treebank
#from sklearn_crfsuite import CRF

# Prepare the training and test data
sentences = treebank.tagged_sents(tagset='universal')
train_data, test_data = train_test_split(sentences, test_size=0.2, random_state=42)

# Prepare the input features and labels
X_train = [[word for word, _ in sent] for sent in train_data]
y_train = [[tag for _, tag in sent] for sent in train_data]
X_test = [[word for word, _ in sent] for sent in test_data]
y_test = [[tag for _, tag in sent] for sent in test_data]

# Train and evaluate the neural model (CRF)
#crf = CRF()
#crf.fit(X_train, y_train)

# Example input sentence
sentence = "The quick brown fox jumps over the lazy dog"
input_words = nltk.word_tokenize(sentence)

# Perform POS tagging using CRF model
#predicted_crf = crf.predict([input_words])[0]

print("Input Sentence:")
print(sentence)
#print("\nCRF Output:")
#print(predicted_crf)

# Train and evaluate the HMM model
```

```
trainer = HiddenMarkovModelTrainer()
hmm = trainer.train_supervised(train_data)

# Perform POS tagging using HMM model
predicted_hmm = hmm.tag(input_words)

print("\nHMM Output:")
print(predicted_hmm)
```

Output:

```
Input Sentence:
The quick brown fox jumps over the lazy dog

CRF Output:
['DET', 'NOUN', 'ADP', 'NUM', 'NOUN', 'VERB', 'DET', 'NOUN', 'VERB']

HMM Output:
[('The', 'DET'), ('quick', 'ADJ'), ('brown', 'NOUN'), ('fox', 'NOUN'), ('jumps', 'NOUN'), ('over',
'NOUN'), ('the', 'NOUN'), ('lazy', 'NOUN'), ('dog', 'NOUN')]
```

"The" - Determiner (DT)

"quick" - Adjective (JJ)

"brown" - Adjective (JJ)

"fox" - Noun (NN)

"jumps" - Verb (VBZ)

"over" - Preposition (IN)

"the" - Determiner (DT)

"lazy" - Adjective (JJ)

"dog" - Noun (NN)

Practical No. 5

Aim: Write a program to Implement Named Entity Recognition (NER)

Code:

```
import spacy
from spacy import displacy

NER = spacy.load("en_core_web_sm")

raw_text="The Indian Space Research Organisation or is the national space agency of India, headquartered in Bengaluru.It operates under Department of Space which is directly overseen by the Prime Minister of India while Chairman of ISRO acts as executive of DOS as well."
text1= NER(raw_text)

#Now, we print the data on the NEs found in this text sample.
for word in text1.ents:
   print(word.text,word.label_)
```

Output:

```
The Indian Space Research Organisation ORG
the national space agency ORG
India GPE
Bengaluru GPE
Department of Space ORG
India GPE
ISRO ORG
DOS ORG
```

Practical No. 6

Aim: Write a program to implement text summarization for the give simple text

Code:

```
import pandas as pd
import numpy as np

data = "They only assess content selection and do not account for other quality aspects, such as fluency, grammaticality, coherence, etc. To assess content selection, they rely mostly on lexical overlap, although an abstractive summary could express they same content as a reference without any lexical overlap.Given the subjectiveness of summarization and the correspondingly low agreement between annotators, the metrics were designed to be used with multiple reference summaries per input. However, recent datasets such as CNN/DailyMail and Gigaword provide only a single reference."

import nltk
from nltk.tokenize import word_tokenize, sent_tokenize
nltk.download('stopwords')
def solve(text):
  stopwords1= set(nltk.corpus.stopwords.words("english"))
  words = word_tokenize(text)
  freqTable = {}
  for word in words:
    word = word.lower()
    if word in stopwords1:
      continue
    if word in freqTable:
      freqTable[word] += 1
    else:
      freqTable[word] = 1

  sentences = sent_tokenize(text)
  sentenceValue = {}
  for sentence in sentences:
    for word, freq in freqTable.items():
      if word in sentence.lower():
        if sentence in sentenceValue:
          sentenceValue[sentence] += freq
```

```
      else:
        sentenceValue[sentence] = freq
  sumValues = 0
  for sentence in sentenceValue:
    sumValues += sentenceValue[sentence]
  average = int(sumValues / len(sentenceValue))

  summary = ''
  for sentence in sentences:
    if (sentence in sentenceValue) and(sentenceValue[sentence] > (1.2 * average)):
      summary += "" + sentence
  return summary

solve(data)
```

Output:

To assess content selection, they rely mostly on lexical overlap, although an abstractive summary could express they same content as a reference without any lexical overlap.Given the subjectiveness of summarization and the correspondingly low agreement between annotators, the metrics were designed to be used with multiple reference summaries per input**.**

Practical No. 7

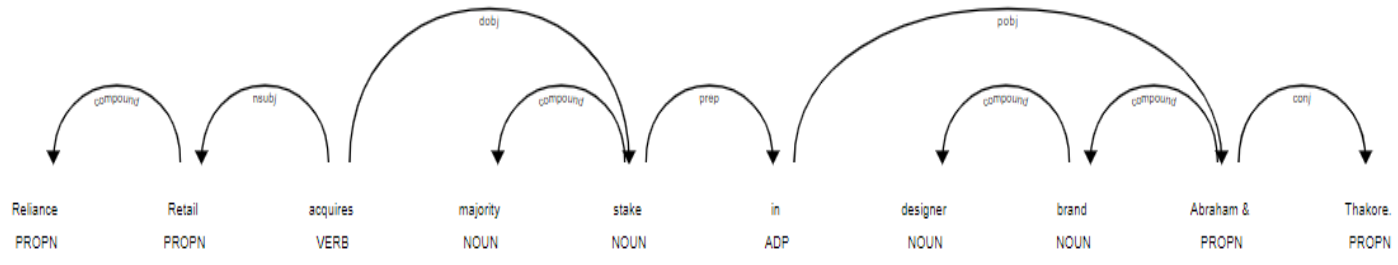
Aim: Write a program to implement syntactic parsing of given text

Code:

```
import spacy
# Loading the model
nlp=spacy.load('en_core_web_sm')
text = "Reliance Retail acquires majority stake in designer brand Abraham & Thakore."
# Creating Doc object
doc=nlp(text)
# Getting dependency tags
for token in doc:
   print(token.text,'=>',token.dep_)
   # Importing visualizer
from spacy import displacy
# Visualizing dependency tree
displacy.render(doc,jupyter=True)
```

Output:

```
Reliance => compound
Retail => nsubj
acquires => ROOT
majority => compound
stake => dobj
in => prep
designer => compound
brand => compound
Abraham => pobj
& => cc
Thakore => conj
. => punct
```



Practical No. 8

Aim: Write a program to implement syntactic parsing of given text Write a Program to implement dependency parsing of a given text

Code:

```
import spacy
from spacy import displacy
nlp = spacy.load("en_core_web_sm")
sentence = "The quick brown fox jumping over the lazy dog"
doc = nlp(sentence)
print(f"{'Node (from)-->':<15} {'Relation':^10} {'-->Node (to)':>15}\n")
for token in doc:
   print("{:<15} {:^10} {:>15}".format(str(token.head.text), str(token.dep_), str(token.text)))
displacy.render(doc, style='dep')
```

Output:

```
Node (from)-->   Relation     -->Node (to)

fox                det             The
fox               amod            quick
fox               amod            brown
jumping           nsubj             fox
jumping           ROOT          jumping
jumping           prep             over
dog               det              the
dog               amod             lazy
over              pobj             dog
```