Practical No. 1:

a) Convert the given text to speech.

Source code:

```
!pip install gtts
!pip install playsound
!pip install pygobject
!pip install sox
import sox
from playsound import playsound
from gtts import gTTS
mytext = "Welcome to Natural Language programming"
language = "en"
myobj = gTTS(text=mytext, lang=language, slow=False)
myobj.save("myfile.mp3")
```

Output:

welcomeNLP.mp3 audio file is getting created and it plays the file with playsound() method, while running the program.

b) Convert audio file Speech to Text.

Source code:

```
!pip3 install SpeechRecognition pydub
import speech_recognition as sr
filename = "about_time.wav"
r = sr.Recognizer()
with sr.AudioFile(filename) as source:
    audio_data = r.record(source)
text = r.recognize_google(audio_data)
print(text)
```

Practical No. 2:

a. **Study of various Corpus – Brown, Inaugural, Reuters, udhr with various methods like filelds, raw, words, sents, categories.**
b. **Create and use your own corpora (plaintext, categorical)**
c. **Study Conditional frequency distributions**
d. **Study of tagged corpora with methods like tagged_sents, tagged_words.**
e. **Write a program to find the most frequent noun tags.**
f. **Map Words to Properties Using Python Dictionaries**
g. **Study DefaultTagger, Regular expression tagger, UnigramTagger**
h. **Find different words from a given plain text without any space by comparing this text with a given corpus of words. Also find the score of words.**

a. Study of various Corpus – Brown, Inaugural, Reuters, udhr with various methods like fields, raw, words, sents, categories,

source code:

```
import nltk
nltk.download('brown')
from nltk.corpus import brown
print ('File ids of brown corpus\n',brown.fileids())
ca01 = brown.words('ca01')
print('\nca01 has following words:\n',ca01)
print('\nca01 has',len(ca01),'words')
print ('\n\nCategories or file in brown corpus:\n')
print (brown.categories())
print ('\n\nStatistics for each text:\n')
print
('AvgWordLen\tAvgSentenceLen\tno.ofTimesEachWordAppearsOnAvg\t\tFileName')
for fileid in brown.fileids():
  num_chars = len(brown.raw(fileid))
  num_words = len(brown.words(fileid))
  num_sents = len(brown.sents(fileid))
  num_vocab = len(set([w.lower() for w in brown.words(fileid)]))
  print (int(num_chars/num_words),'\t\t\t', int(num_words/num_sents),'\t\t\t',
    int(num_words/num_vocab),'\t\t\t', fileid)
```

output:

b. Create and use your own corpora (plaintext, categorical)

source code:

'''NLTK includes a small selection of texts from the Project filelist electronic text archive, which contains some 25,000 free electronic books, hosted at http://www.filelist.org/. We begin by getting the Python interpreter to load the NLTK package, then ask to see nltk.corpus.filelist.fileids(), the file identifiers in this corpus:'''

```
import nltk
from nltk.corpus import PlaintextCorpusReader

corpus_root = '/content/sample_data/uni1'
filelist = PlaintextCorpusReader(corpus_root, '.*')
print ('\n File list: \n')
print (filelist.fileids())
print(filelist.root)
print('\n\nStatistics for each text:\n')
print('AvgWordLen\tAvgSentenceLen\tno.ofTimesEachWordAppearsOnAvg\tFileName')
for fileid in filelist.fileids():
   num_chars = len(filelist.raw(fileid))
   num_words = len(filelist.words(fileid))
   num_sents = len(filelist.sents(fileid))
   num_vocab = len(set([w.lower() for w in filelist.words(fileid)]))
   print (int(num_chars/num_words),'\t\t\t', int(num_words/num_sents),'\t\t\t',
int(num_words/num_vocab),'\t\t', fileid)
```

output:

c. Study Conditional frequency distributions

source code:

```
text = ['The', 'Fulton', 'County', 'Grand', 'Jury', 'said', ...]
pairs = [('news', 'The'), ('news', 'Fulton'), ('news', 'County'), ...]
import nltk
nltk.download('inaugural')
nltk.download('udhr')
from nltk.corpus import brown
fd = nltk.ConditionalFreqDist(
(genre, word)
for genre in brown.categories()
for word in brown.words(categories=genre))

genre_word = [(genre, word)
for genre in ['news', 'romance']
for word in brown.words(categories=genre)]
print(len(genre_word))

print(genre_word[:4])
print(genre_word[-4:])
cfd = nltk.ConditionalFreqDist(genre_word)
print(cfd)
print(cfd.conditions())

print(cfd['news'])
print(cfd['romance'])
print(list(cfd['romance']))

from nltk.corpus import inaugural
cfd = nltk.ConditionalFreqDist(
(target, fileid[:4])
for fileid in inaugural.fileids()
for w in inaugural.words(fileid)
for target in ['america', 'citizen']
if w.lower().startswith(target))

from nltk.corpus import udhr
```

```
languages = ['Chickasaw', 'English', 'German_Deutsch', 'Greenlandic_Inuktikut',
'Hungarian_Magyar', 'Ibibio_Efik']
cfd = nltk.ConditionalFreqDist( (lang, len(word))
  for lang in languages
for word in udhr.words(lang + '-Latin1'))

cfd.tabulate(conditions=['English', 'German_Deutsch'], samples=range(10), cumulative=True)
```

output:

d. Study of tagged corpora with methods like tagged_sents, tagged_words.

Source code:

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

para = "Hello! My name is Beena Kapadia. Today you'll be learning NLTK."
sents = tokenize.sent_tokenize(para)
print("\nsentence tokenization\n===================\n",sents)

# word tokenization
print("\nword tokenization\n===================\n")
for index in range(len(sents)):
 words = tokenize.word_tokenize(sents[index])
 print(words)
```

output:

e. Write a program to find the most frequent noun tags.

Code:

```
import nltk

from collections import defaultdict

nltk.download('averaged_perceptron_tagger')

text = nltk.word_tokenize("Nick likes to play

football. Nick does not like to play cricket.")

tagged = nltk.pos_tag(text)

print(tagged)

addNounWords = []

count=0

for words in tagged:

 val = tagged[count][1]

 if(val == 'NN' or val == 'NNS' or val == 'NNPS' or

val == 'NNP'):

  addNounWords.append(tagged[count][0])

  count+=1
```

```
print (addNounWords)

temp = defaultdict(int)

for sub in addNounWords:

  for wrd in sub.split(): temp[wrd] += 1

res = max(temp, key=temp.get)

print("Word with maximum frequency : " + str(res))
```

output:

f. Map Words to Properties Using Python Dictionaries

code:

```
thisdict = {
"brand": "Ford",
"model": "Mustang", "year": 1964
}
print(thisdict)
print(thisdict["brand"])
print(len(thisdict))
print(type(thisdict))
```

output:

g. Study i) DefaultTagger, ii) Regular expression tagger, iii) UnigramTagger

i) DefaultTagger

code:

```
import nltk
nltk.download('treebank')
from nltk.tag import DefaultTagger
exptagger = DefaultTagger('NN')
from nltk.corpus import treebank
testsentences = treebank.tagged_sents() [1000:]
print(exptagger.evaluate (testsentences))


from nltk.tag import DefaultTagger
exptagger = DefaultTagger('NN')
print(exptagger.tag_sents([['Hi', ','], ['How', 'are', 'you', '?']]))
```

output

ii) Regular expression tagger,

code:

```
from nltk.corpus import brown
from nltk.tag import RegexpTagger
test_sent =
brown.sents(categories='news')[0]
regexp_tagger = RegexpTagger(
[(r'^-?[0-9]+(.[0-9]+)?$', 'CD'),
(r'.*ness$', 'NN'),
(r'.*s$', 'NNS'),
(r'.*ing$', 'VBG'),
(r'.*ed$', 'VBD'),
])
print(regexp_tagger)
print(regexp_tagger.tag(test_sent))
```

output:

iii) UnigramTagger

code:

```
from nltk.tag import UnigramTagger
from nltk.corpus import treebank

train_sents = treebank.tagged_sents()[:10]

tagger = UnigramTagger(train_sents)

tagger = UnigramTagger(model ={'Pierre': 'NN'})
print('\n',tagger.tag(treebank.sents()[0]))
```

output:

h. Find different words from a given plain text without any space by comparing this text with a given corpus of words. Also find the score of words.

Question:

Initialize the hash tag test data or URL test data and convert to plain text without any space.. Read a text file of different words and compare the plain text data with the words exist in that text file and find out different words available in that plain text. Also find out how many words could be found. (for example, text = "#whatismyname" or text = www.whatismyname.com. Convert that to plain text without space as: whatismyname and read text file as words.txt. Now compare plain text with words given in a file and find the words form the plain text and the count of words which could be found)

Source code:

```
from___future___import with_statement #with statement for reading file
import re  # Regular expression
```

```
words = [] # corpus file words
testword = [] # test words
ans = []    # words matches with corpus

print("MENU")
print("................")
print(" 1 . Hash tag segmentation ")
print(" 2 . URL segmentation ")
print("enter the input choice for performing word segmentation")
choice = int(input())

if choice == 1:
    text = "#whatismyname"         # hash tag test data to segment
    print("input with HashTag",text)
    pattern=re.compile("[^\w']")
    a = pattern.sub('', text)
elif choice == 2:
    text = "www.whatismyname.com"       # url test data to segment
    print("input with URL",text)
    a=re.split('\s|(?<!\d)[,.](?!\d)', text)
    splitwords = ["www","com","in"]      # remove the words which is containg in the list
    a ="".join([each for each in a if each not in splitwords])
else:
    print("wrong choice...try again")
print(a)

for each in a:
    testword.append(each)  #test word
test_lenth = len(testword)       # lenth of the test data

# Reading the corpus
with open('words.txt', 'r') as f:
    lines = f.readlines()
    words =[(e.strip()) for e in lines]

def Seg(a,lenth):
    ans =[]
    for k in range(0,lenth+1):  # this loop checks char by char in the corpus

        if a[0:k] in words:
            print(a[0:k],"-appears in the corpus")
            ans.append(a[0:k])
            break
    if ans != []:
        g = max(ans,key=len)
        return g

test_tot_itr = 0    #each iteration value
answer = []     # Store the each word contains the corpus
Score = 0  # initial value for score
```

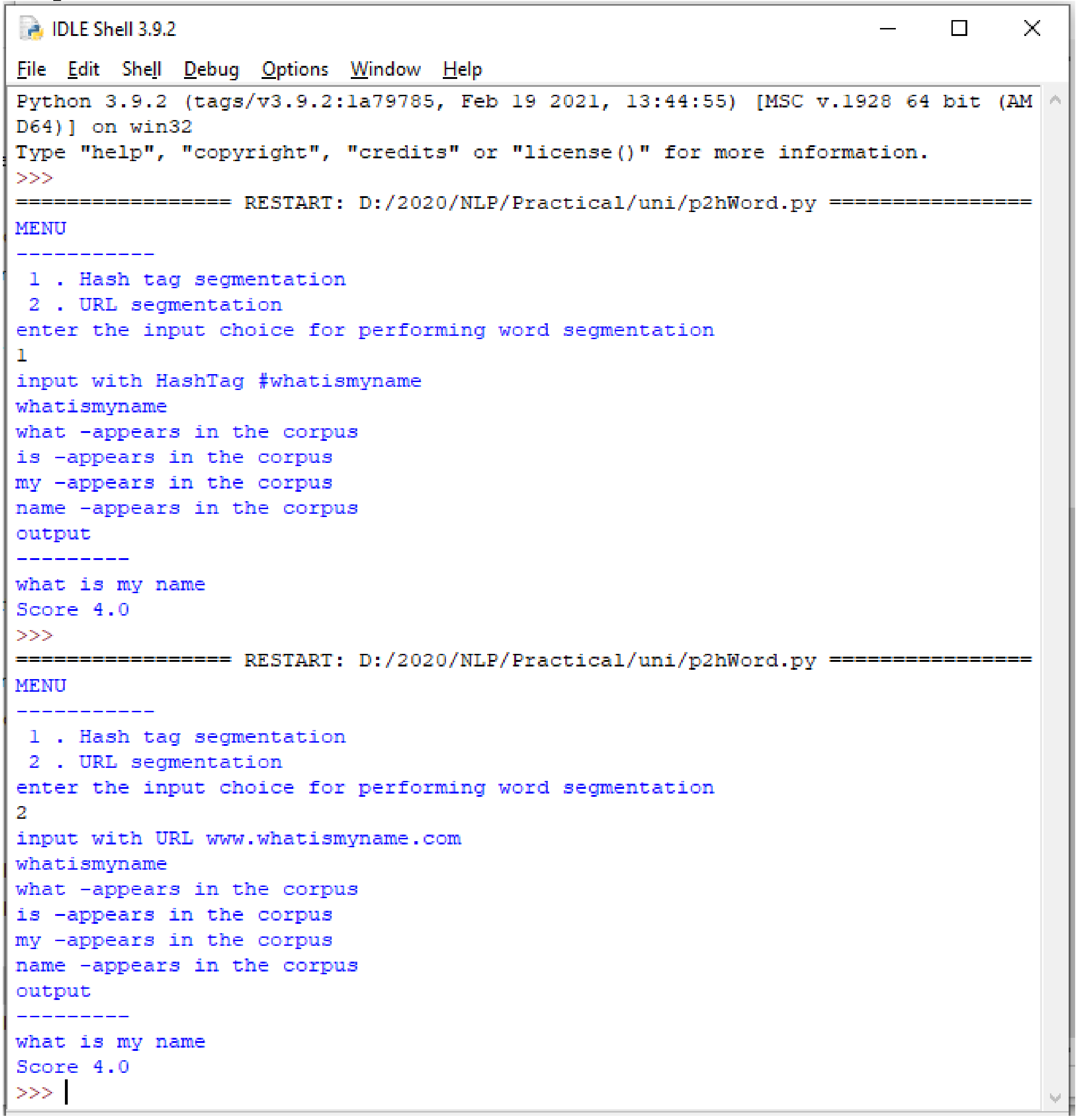
```
N = 37    # total no of corpus
M = 0
C = 0
while test_tot_itr < test_lenth:
    ans_words = Seg(a,test_lenth)
    if ans_words != 0:
        test_itr = len(ans_words)
        answer.append(ans_words)
        a = a[test_itr:test_lenth]
        test_tot_itr += test_itr

Aft_Seg = " ".join([each for each in answer])
# print segmented words in the list
print("output")
print(" --------")
print(Aft_Seg)  # print After segmentation the input

# Calculating Score
C = len(answer)
score = C * N / N       # Calculate the score
print("Score",score)
```

Input:

Words.txt

```
- - - - - - - - -
check
domain
big
rocks
name
cheap
being
human
current
rates
ought
to
go
down
apple
domains
honesty
hour
follow
back
social
media
30
seconds
earth
this
is
insane
it
time
what
is
my
name
let
us
go
```

Output:



```
Python 3.9.2 (tags/v3.9.2:1a79785, Feb 19 2021, 13:44:55) [MSC v.1928 64 bit (AM
D64)] on win32
Type "help", "copyright", "credits" or "license()" for more information.
>>> 
================= RESTART: D:/2020/NLP/Practical/uni/p2hWord.py ================
MENU
-----------
 1 . Hash tag segmentation
 2 . URL segmentation
enter the input choice for performing word segmentation
1
input with HashTag #whatismyname
whatismyname
what -appears in the corpus
is -appears in the corpus
my -appears in the corpus
name -appears in the corpus
output
---------
what is my name
Score 4.0
>>> 
================= RESTART: D:/2020/NLP/Practical/uni/p2hWord.py ================
MENU
-----------
 1 . Hash tag segmentation
 2 . URL segmentation
enter the input choice for performing word segmentation
2
input with URL www.whatismyname.com
whatismyname
what -appears in the corpus
is -appears in the corpus
my -appears in the corpus
name -appears in the corpus
output
---------
what is my name
Score 4.0
>>> 
```

3. a. **Study of Wordnet Dictionary with methods as synsets, definitions, examples, antonyms**

Source code:

```
'''WordNet provides synsets which is the collection of synonym words also called
        “lemmas”'''
import nltk
from nltk.corpus import wordnet
print(wordnet.synsets("computer"))

print(wordnet.synset("computer.n.01").definition())


print("Examples:", wordnet.synset("computer.n.01").examples())


print(wordnet.lemma('buy.v.01.buy').antonyms())
```

output:

b. Study lemmas, hyponyms, hypernyms.

Source code:

```
import nltk
from nltk.corpus import wordnet
print(wordnet.synsets("computer"))
print(wordnet.synset("computer.n.01").lemma_names())
for e in wordnet.synsets("computer"):
  print(f'{e} --> {e.lemma_names()}')

print(wordnet.synset('computer.n.01').lemmas())

print(wordnet.lemma('computer.n.01.computing_device').synset())

print(wordnet.lemma('computer.n.01.computing_device').name())


syn = wordnet.synset('computer.n.01')
print(syn.hyponyms)
print([lemma.name()
for synset in syn.hyponyms()
for lemma in synset.lemmas()])
vehicle = wordnet.synset('vehicle.n.01')
car = wordnet.synset('car.n.01')

print(car.lowest_common_hypernyms(vehicle))
```

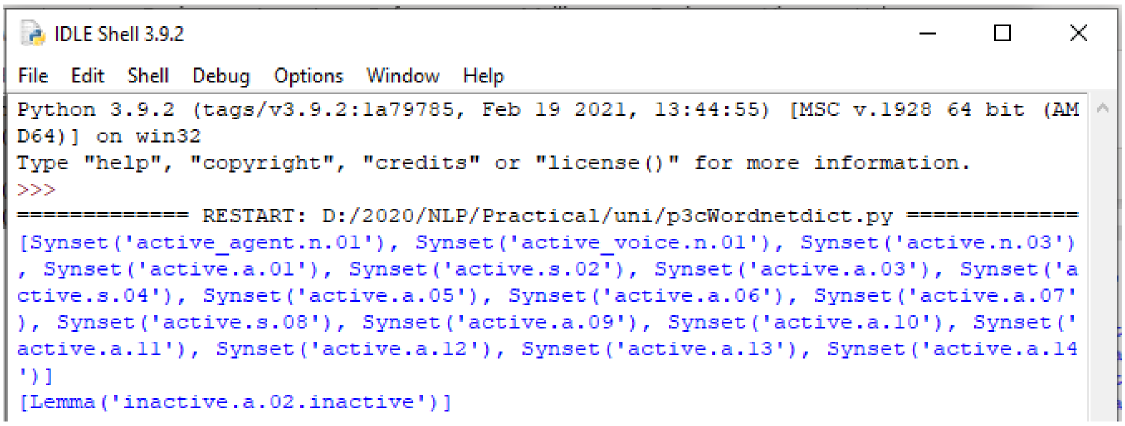
Output:

c. Write a program using python to find synonym and antonym of word "active" using Wordnet.

Source code:

```
from nltk.corpus import wordnet
print( wordnet.synsets("active"))

print(wordnet.lemma('active.a.01.active').antonyms())
```

Output:



```
Python 3.9.2 (tags/v3.9.2:1a79785, Feb 19 2021, 13:44:55) [MSC v.1928 64 bit (AM
D64)] on win32
Type "help", "copyright", "credits" or "license()" for more information.
>>>
============= RESTART: D:/2020/NLP/Practical/uni/p3cWordnetdict.py =============
[Synset('active_agent.n.01'), Synset('active_voice.n.01'), Synset('active.n.03')
, Synset('active.a.01'), Synset('active.s.02'), Synset('active.a.03'), Synset('a
ctive.s.04'), Synset('active.a.05'), Synset('active.a.06'), Synset('active.a.07'
), Synset('active.s.08'), Synset('active.a.09'), Synset('active.a.10'), Synset('
active.a.11'), Synset('active.a.12'), Synset('active.a.13'), Synset('active.a.14
')]
[Lemma('inactive.a.02.inactive')]
```

d. Compare two nouns

source code:

```
import nltk
from nltk.corpus import wordnet

syn1 = wordnet.synsets('football')
syn2 = wordnet.synsets('soccer')

for s1 in syn1:
  for s2 in syn2:
    print("Path similarity of: ")
    print(s1, '(', s1.pos(), ')', '[', s1.definition(), ']')
    print(s2, '(', s2.pos(), ')', '[', s2.definition(), ']')
    print(" is", s1.path_similarity(s2))
    print()
```

output:

e. Handling stopword:

i) Using nltk Adding or Removing Stop Words in NLTK's Default Stop Word List

code:

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

text = "Yashesh likes to play football, however he is not too fond of tennis."
text_tokens = word_tokenize(text)

tokens_without_sw = [word for word in text_tokens if not word in stopwords.words()]

print(tokens_without_sw)

all_stopwords = stopwords.words('english')
all_stopwords.append('play')

text_tokens = word_tokenize(text)
tokens_without_sw = [word for word in text_tokens if not word in all_stopwords]
print(tokens_without_sw)
all_stopwords.remove('not')

text_tokens = word_tokenize(text)
tokens_without_sw = [word for word in text_tokens if not word in all_stopwords]
print(tokens_without_sw)
```

output

ii) Using Gensim Adding and Removing Stop Words in Default Gensim Stop Words List

code:

```
!pip install gensim
import gensim
from gensim.parsing.preprocessing import remove_stopwords

text = "Yashesh likes to play football, however he is not too fond of tennis."
filtered_sentence = remove_stopwords(text)

print(filtered_sentence)

all_stopwords = gensim.parsing.preprocessing.STOPWORDS
print(all_stopwords)

'''The following script adds likes and play to the list of
 stop words in Gensim:'''
from gensim.parsing.preprocessing import STOPWORDS
all_stopwords_gensim = STOPWORDS.union(set(['likes', 'play']))
text = "Yashesh likes to play football, however he is not too fond of tennis."
text_tokens = word_tokenize(text)
tokens_without_sw = [word for word in text_tokens if not word in all_stopwords_gensim]

print(tokens_without_sw)

'''Output:
['Yashesh', 'football', ',', 'fond', 'tennis', '.']

The following script removes the word "not" from the set of stop words in Gensim:'''
from gensim.parsing.preprocessing import STOPWORDS
all_stopwords_gensim = STOPWORDS
sw_list = {"not"}
all_stopwords_gensim = STOPWORDS.difference(sw_list)

text = "Yashesh likes to play football, however he is not too fond of tennis."
text_tokens = word_tokenize(text)
tokens_without_sw = [word for word in text_tokens if not word in all_stopwords_gensim]

print(tokens_without_sw)
```

output

```
Microsoft Visual C++ 14.0 is required. Get it with "Build Tools for Visual Studio": https://visualstudio.microsoft.com/downloads/
```

iii) Using Spacy Adding and Removing Stop Words in Default Spacy Stop Words List

code:

```
!pip install spacy
!python -m spacy download en_core_web_sm
!python -m spacy download en

import spacy
import nltk
from nltk.tokenize import word_tokenize
sp = spacy.load('en_core_web_sm')
#add the word play to the NLTK stop word collection
all_stopwords = sp.Defaults.stop_words
all_stopwords.add("play")

text = "Yashesh likes to play football, however he is not too fond of tennis."
text_tokens = word_tokenize(text)
tokens_without_sw = [word for word in text_tokens if not word in all_stopwords]
print(tokens_without_sw)
#remove 'not' from stop word collection
all_stopwords.remove('not')

tokens_without_sw = [word for word in text_tokens if not word in all_stopwords]
print(tokens_without_sw)
```

output:

4. Text Tokenization

a. Tokenization using Python’s split() function

code:

```
text = """ This tool is an a beta stage. Alexa developers can use Get Metrics API to seamlessly analyse metric. It also supports custom skill model, prebuilt Flash Briefing model, and the Smart Home Skill API. You can use this tool for creation of monitors, alarms, and dashboards that spotlight changes. The release of these three tools will enable developers to create visual rich skills for Alexa devices with screens. Amazon describes these tools as the collection of tech and tools for creating visually rich and interactive voice experiences. """
data = text.split('.')
for i in data:
  print (i)
```

output:

b. Tokenization using Regular Expressions (RegEx)

code:

```
import nltk
from nltk.tokenize import RegexpTokenizer
tk = RegexpTokenizer('\s+', gaps = True)

str = "I love to study Natural Language Processing in Python"
tokens = tk.tokenize(str)

print(tokens)
```

output:

c. Tokenization using NLTK

code:

```
import nltk
from nltk.tokenize import word_tokenize

str = "I love to study Natural Language Processing in Python"
print(word_tokenize(str))
```

output:

d. Tokenization using the spaCy library

code:

```
import spacy
nlp = spacy.blank("en")
str = "I love to study Natural Language Processing in Python"
doc = nlp(str)

words = [word.text for word in doc]
print(words)
```

output:

e. Tokenization using Keras

code:

```
!pip install keras
!pip install tensorflow
import keras
from keras.preprocessing.text import text_to_word_sequence
```

```
str = "I love to study Natural Language Processing in Python"

tokens = text_to_word_sequence(str)
print(tokens)
```

output:

f. Tokenization using Gensim

code:

```
!pip install gensim

from gensim.utils import tokenize
str = "I love to study Natural Language Processing in Python"
list(tokenize(str))
```

output:

```
Microsoft Visual C++ 14.0 is required. Get it with "Build Tools for Visual Studio":
https://visualstudio.microsoft.com/downloads/
```

5. **Import NLP Libraries for Indian Languages and perform:**

Note: Execute this practical in https://colab.research.google.com/

a) word tokenization in Hindi

Source code:

```
!pip install torch==1.3.1+cpu -f https://download.pytorch.org/whl/torch_stable.html

!pip install inltk

!pip install tornado==4.5.3

from inltk.inltk import setup
setup('hi')

from inltk.inltk import tokenize

hindi_text = """प्राकृ तिक भाषा सीखना बहुि तिलचस्प है।"""

# tokenize(input text, language code)
tokenize(hindi_text, "hi")
```

output

```
['▁प्राकृ तिक', '▁भाषा', '▁सीखना', '▁बहुि', '▁तिलचस्प', '▁है', '।']
```

b) Generate similar sentences from a given Hindi text input

Source code:

```
!pip install torch==1.3.1+cpu -f https://download.pytorch.org/whl/torch_stable.html

!pip install inltk

!pip install tornado==4.5.3

from inltk.inltk import setup
setup('hi')

from inltk.inltk import get_similar_sentences

# get similar sentences to the one given in hindi
output = get_similar_sentences('मैं आज बहुि खुश हूं', 5, 'hi')

print(output)
```

Output:

```
['मैं आजकल बहुि खुश हूं', 'मैं आज अत्यतिक खुश हूं', 'मैं अभी बहुि
खुश हूं', 'मैं वतिमान बहुि खुश हूं', 'मैं वतिमान बहुि खुश हूं']
```

c) Identify the Indian language of a text

Source code:

```
!pip install torch==1.3.1+cpu -f https://download.pytorch.org/whl/torch_stable.html
```

```
!pip install inltk

!pip install tornado==4.5.3

from inltk.inltk import setup
setup('gu')

from inltk.inltk import identify_language
#Identify the Lnaguage of given text
identify_language('બીના કાપડિયા')
```

Output:

```
gujarati
```

6. Illustrate part of speech tagging.

a. Part of speech Tagging and chunking of user defined text.
b. Named Entity recognition of user defined text.
c. Named Entity recognition with diagram using NLTK corpus – treebank

POS Tagging, chunking and NER:

a) sentence tokenization, word tokenization, Part of speech Tagging and chunking of user defined text.

Source code:

```
import nltk
from nltk import tokenize
nltk.download('punkt')
from nltk import  tag
from nltk import chunk
nltk.download('averaged_perceptron_tagger')
nltk.download('maxent_ne_chunker')
nltk.download('words')

para = "Hello! My name is Beena Kapadia. Today you'll be learning NLTK."
sents = tokenize.sent_tokenize(para)
print("\nsentence tokenization\n===================\n",sents)

# word tokenization
print("\nword tokenization\n===================\n")
for index in range(len(sents)):
  words = tokenize.word_tokenize(sents[index])
  print(words)



# POS Tagging

tagged_words = []
for index in range(len(sents)):
  tagged_words.append(tag.pos_tag(words))
print("\nPOS Tagging\n===========\n",tagged_words)


# chunking

tree = []
for index in range(len(sents)):
tree.append(chunk.ne_chunk(tagged_words[index]))
print("\nchunking\n========\n")
print(tree)
```

Output:

```
sentence tokenization
===================
 ['Hello!', 'My name is Beena Kapadia.', "Today you'll be learning NLTK."]
```

```
word tokenization
===================

['Hello', '!']
['My', 'name', 'is', 'Beena', 'Kapadia', '.']
['Today', 'you', "'ll", 'be', 'learning', 'NLTK', '.']

POS Tagging
===========
 [[('Today', 'NN'), ('you', 'PRP'), ("'ll", 'MD'), ('be', 'VB'), ('learning', 'VBG'), ('NLTK',
'NNP'), ('.', '.')], [('Today', 'NN'), ('you', 'PRP'), ("'ll", 'MD'), ('be', 'VB'), ('learning',
'VBG'), ('NLTK', 'NNP'), ('.', '.')], [('Today', 'NN'), ('you', 'PRP'), ("'ll", 'MD'), ('be',
'VB'), ('learning', 'VBG'), ('NLTK', 'NNP'), ('.', '.')]]

chunking
========

[Tree('S', [('Today', 'NN'), ('you', 'PRP'), ("'ll", 'MD'), ('be', 'VB'), ('learning', 'VBG'),
Tree('ORGANIZATION', [('NLTK', 'NNP')]), ('.', '.')]), Tree('S', [('Today', 'NN'), ('you',
'PRP'), ("'ll", 'MD'), ('be', 'VB'), ('learning', 'VBG'), Tree('ORGANIZATION', [('NLTK',
'NNP')]), ('.', '.')]), Tree('S', [('Today', 'NN'), ('you', 'PRP'), ("'ll", 'MD'), ('be', 'VB'),
('learning', 'VBG'), Tree('ORGANIZATION', [('NLTK', 'NNP')]), ('.', '.')])]
```

b) Named Entity recognition using user defined text.

Source code:

```
!pip install -U spacy
!python -m spacy download en_core_web_sm
import spacy

# Load English tokenizer, tagger, parser and NER
nlp = spacy.load("en_core_web_sm")

# Process whole documents
text = ("When Sebastian Thrun started working on self-driving cars at "
        "Google in 2007, few people outside of the company took him "
        "seriously. “I can tell you very senior CEOs of major American "
        "car companies would shake my hand and turn away because I wasn’t "
        "worth talking to,” said Thrun, in an interview with Recode earlier "
        "this week.")
doc = nlp(text)

# Analyse syntax
print("Noun phrases:", [chunk.text for chunk in doc.noun_chunks])
print("Verbs:", [token.lemma_ for token in doc if token.pos_ == "VERB"])
```

Output:

```
Noun phrases: ['Sebastian Thrun', 'self-driving cars', 'Google', 'few people', 'the
company', 'him', 'I', 'you', 'very senior CEOs', 'major American car companies', 'my
hand', 'I', 'Thrun', 'an interview', 'Recode']
```

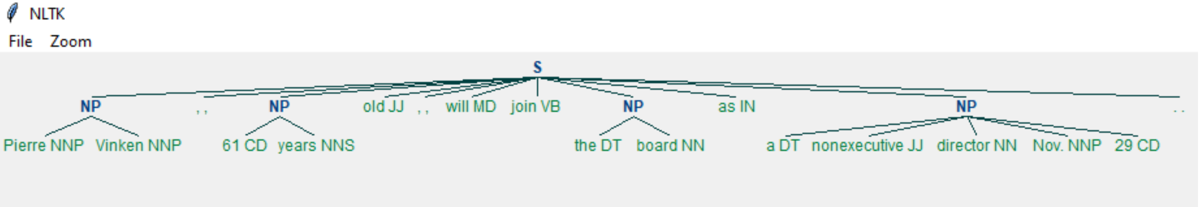
Verbs: ['start', 'work', 'drive', 'take', 'tell', 'shake', 'turn', 'be', 'talk', 'say']

c) Named Entity recognition with diagram using NLTK corpus – treebank.
Source code:

Note: It runs on Python IDLE

```
import nltk
nltk.download('treebank')
from nltk.corpus import treebank_chunk
treebank_chunk.tagged_sents()[0]

treebank_chunk.chunked_sents()[0]
treebank_chunk.chunked_sents()[0].draw()
```

Output:



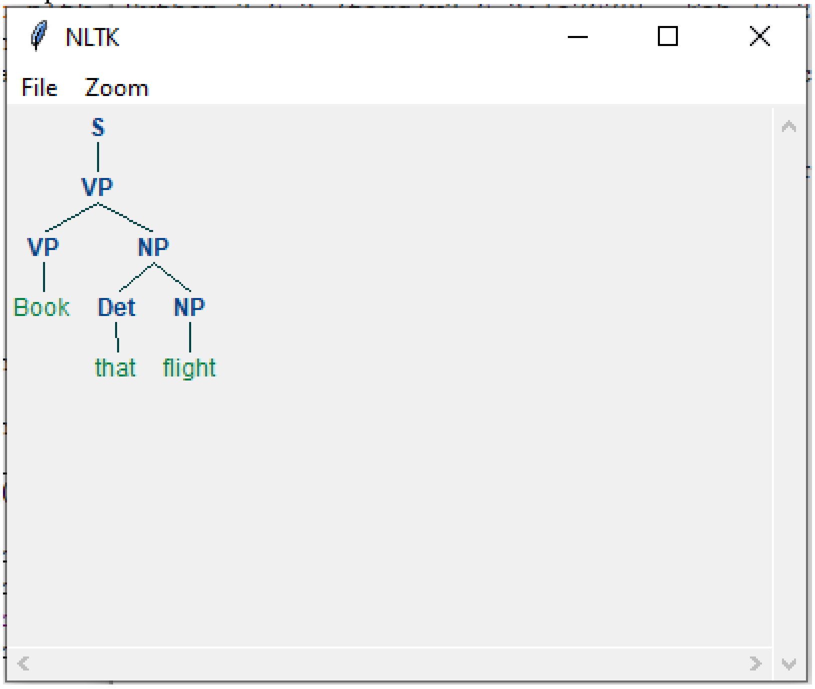
7. Finite state automata

a) Define grammar using nltk. Analyze a sentence using the same.

Code:

```
import nltk
nltk.download('punkt')
from nltk import tokenize

grammar1 = nltk.CFG.fromstring("""
   S -> VP
   VP -> VP NP
   NP -> Det NP | singular Noun
   Det -> 'that'
   NP -> 'flight'
   VP -> 'Book'
""")

sentence = "Book that flight"

all_tokens = tokenize.word_tokenize(sentence)

parser = nltk.ChartParser(grammar1)

for tree in parser.parse(all_tokens):
   print(tree)
   tree.draw()
```

output:



b) Accept the input string with Regular expression of Finite Automaton: 101+.

Source code:

```
!pip install numpy

# Import the required modules
```

```
import numpy as np

def FA(s):
    if len(s) < 3:
        return "Rejected"
    if s[0] == '1':
        if s[1] == '0':
            if s[2] == '1':
                for i in range(3, len(s)):
                    if s[i] != '1':
                        return "Rejected"
                return "Accepted"
            else:
                return "Rejected"
        else:
            return "Rejected"
    else:
        return "Rejected"

# Define the input strings
inputs = ['1', '10101', '101', '10111', '01010', '100', '', '10111101', '1011111']

# Evaluate the FA function for each input string
for i in inputs:
    print(FA(i))
```

Output:

```
Rejected
Rejected
Accepted
Accepted
Rejected
Rejected
Rejected
Rejected
Accepted
```

c) Accept the input string with Regular expression of FA: (a+b)*bba.

Code:

```
!pip install colorama
from colorama import Fore, Style

def FA(s):
    size = 0
    # scan complete string and make sure that it contains only 'a' & 'b'
    for i in s:
        if i == 'a' or i == 'b':
            size += 1
        else:
            return Fore.RED + "Rejected" + Style.RESET_ALL
    # After checking that it contains only 'a' & 'b'
    # check it's length it should be 3 atleast
```

```
 if size >= 3:
     # check the last 3 elements
     if s[size - 3] == 'b':
         if s[size - 2] == 'b':
             if s[size - 1] == 'a':
                 return Fore.GREEN + "Accepted" + Style.RESET_ALL
             # if all 4 if true return "Rejected"
             else:
                 return Fore.RED + "Rejected" + Style.RESET_ALL
         # else of 4th if
         else:
             return Fore.RED + "Rejected" + Style.RESET_ALL
     # else of 3rd if
     else:
         return Fore.RED + "Rejected" + Style.RESET_ALL
 # else of 2nd if
 else:
     return Fore.RED + "Rejected" + Style.RESET_ALL
 # else of 1st if

 return Fore.RED + "Rejected" + Style.RESET_ALL


inputs = ['bba', 'ababbba', 'abba', 'abb', 'baba', 'bbb', '']
for i in inputs:
    print(FA(i))
```

output:

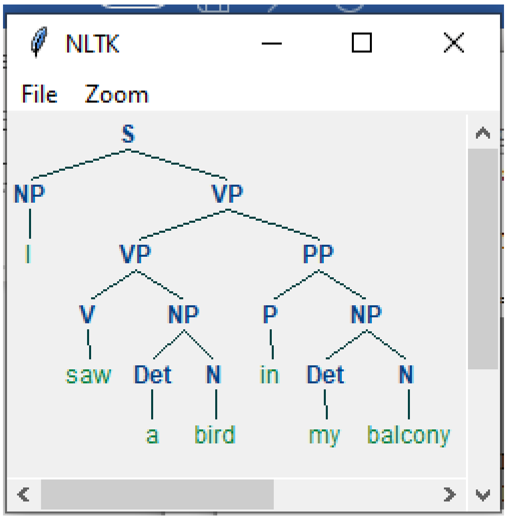
```
Rejected
Rejected
Accepted
Accepted
Rejected
Rejected
Rejected
Rejected
Accepted
```

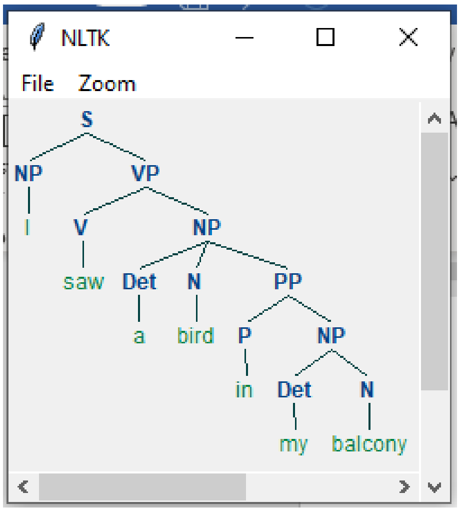
d) **Implementation of Deductive Chart Parsing using context free grammar and a given sentence.**

Source code:

```
import nltk
from nltk import tokenize

grammar1 = nltk.CFG.fromstring("""
    S -> NP VP
    PP -> P NP
    NP -> Det N | Det N PP | 'I'
    VP -> V NP | VP PP
    Det -> 'a' | 'my'
    N -> 'bird' | 'balcony'
    V -> 'saw'
    P -> 'in'
""")

sentence = "I saw a bird in my balcony"

all_tokens = tokenize.word_tokenize(sentence)

parser = nltk.ChartParser(grammar1)

for tree in parser.parse(all_tokens):
    print(tree)
    tree.draw()
```

output:


NLTK
File Zoom
S
NP
VP
I
VP
PP
V
NP
P
NP
saw
Det
N
in
Det
N
a
bird
my
balcony

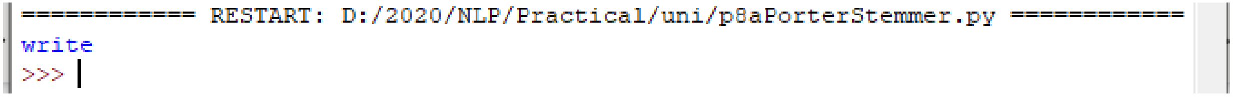

NLTK
File Zoom
S
NP
VP
I
V
NP
saw
Det
N
PP
a
bird
P
NP
in
Det
N
my
balcony

8. Study PorterStemmer, LancasterStemmer, RegexpStemmer, SnowballStemmer Study WordNetLemmatizer

Code:

```
# PorterStemmer
import nltk
from nltk.stem import PorterStemmer
word_stemmer = PorterStemmer()
print(word_stemmer.stem('writing'))
```

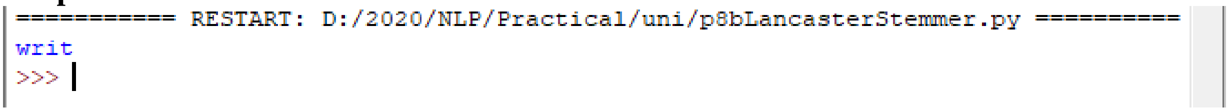
Output:



```
============ RESTART: D:/2020/NLP/Practical/uni/p8aPorterStemmer.py ============
write
>>> 
```

```
#LancasterStemmer
import nltk
from nltk.stem import LancasterStemmer
Lanc_stemmer = LancasterStemmer()
print(Lanc_stemmer.stem('writing'))
```

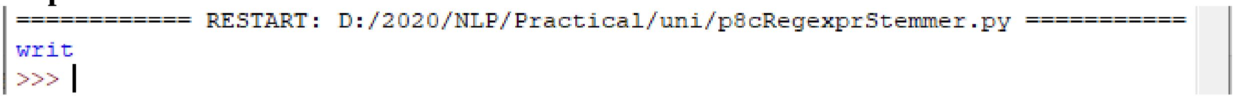
Output:



```
=========== RESTART: D:/2020/NLP/Practical/uni/p8bLancasterStemmer.py ==========
writ
>>> 
```

```
#RegexpStemmer
import nltk
from nltk.stem import RegexpStemmer
Reg_stemmer = RegexpStemmer('ing$|s$|e$|able$', min=4)
print(Reg_stemmer.stem('writing'))
```

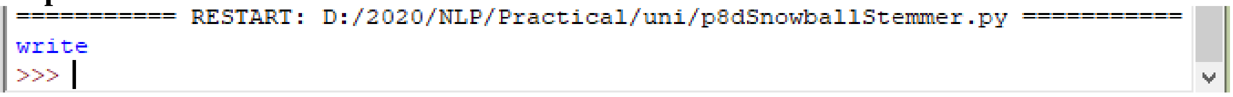
output



```
============ RESTART: D:/2020/NLP/Practical/uni/p8cRegexprStemmer.py ===========
writ
>>> 
```

```
#SnowballStemmer
import nltk
from nltk.stem import SnowballStemmer
english_stemmer = SnowballStemmer('english')
print(english_stemmer.stem ('writing'))
```

output

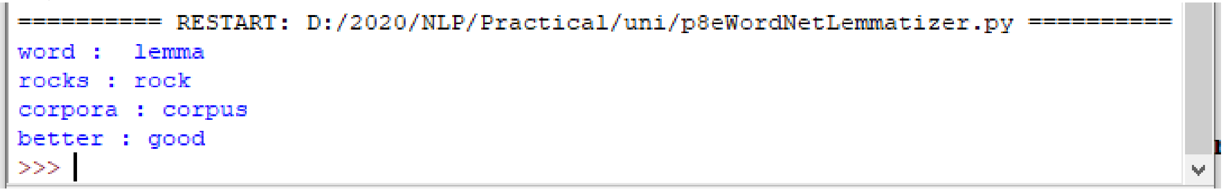


```
=========== RESTART: D:/2020/NLP/Practical/uni/p8dSnowballStemmer.py ===========
write
>>> 
```

```
#WordNetLemmatizer
import nltk
nltk.download('wordnet')
from nltk.stem import WordNetLemmatizer
lemmatizer = WordNetLemmatizer()
```

```
print("word :\tlemma")
print("rocks :", lemmatizer.lemmatize("rocks"))
print("corpora :", lemmatizer.lemmatize("corpora"))

# a denotes adjective in "pos"
print("better :", lemmatizer.lemmatize("better", pos ="a"))
```

Output:



```
========== RESTART: D:/2020/NLP/Practical/uni/p8eWordNetLemmatizer.py ==========
word :  lemma
rocks : rock
corpora : corpus
better : good
>>>
```

9. Implement Naive Bayes classifier

Code:

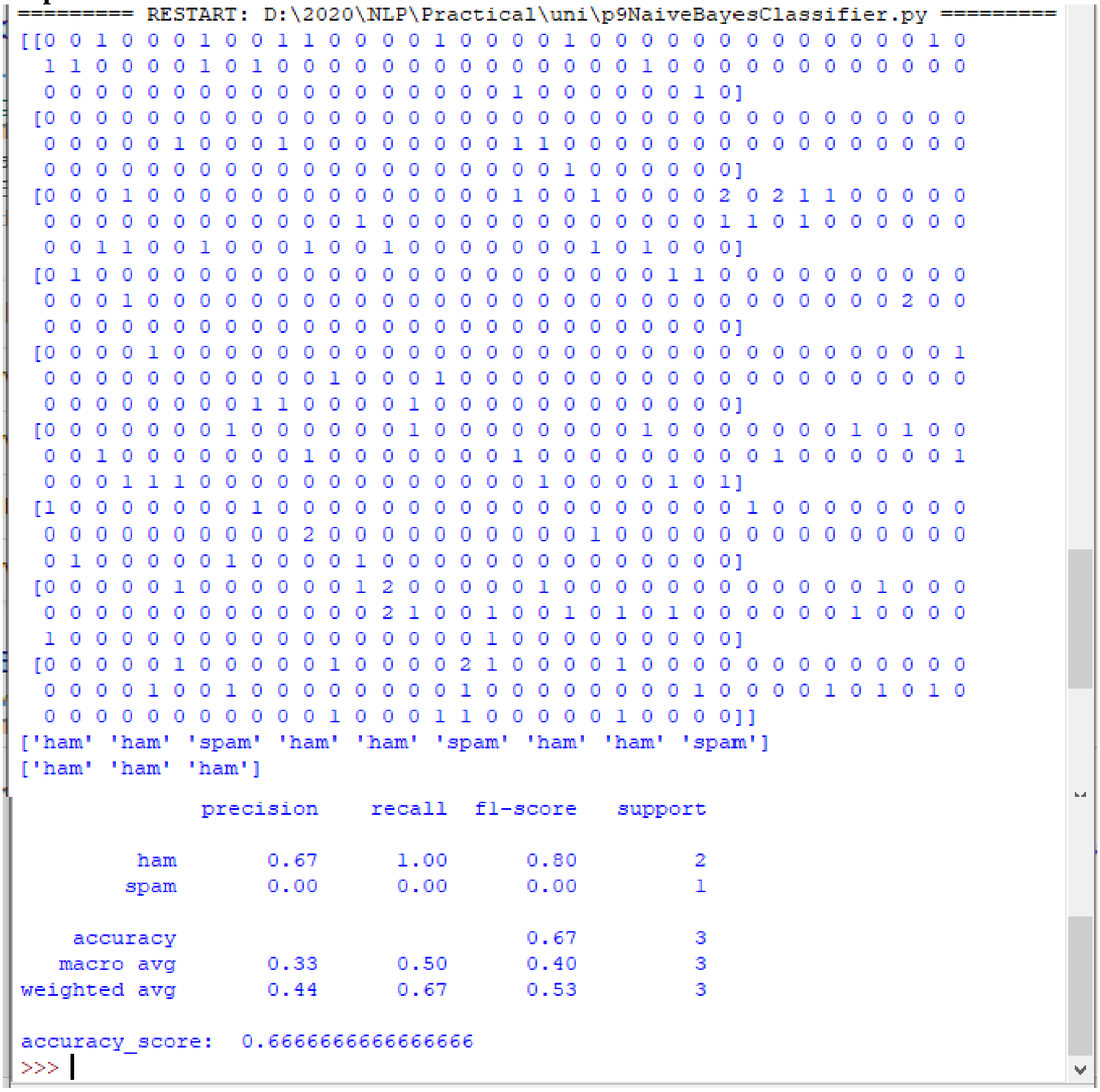
```
#pip install pandas
#pip install sklearn

import pandas as pd
import numpy as np

sms_data = pd.read_csv("spam.csv", encoding='latin-1')

import re
import nltk
from nltk.corpus import stopwords
from nltk.stem.porter import PorterStemmer

stemming = PorterStemmer()
corpus = []
for i in range (0,len(sms_data)):
    s1 = re.sub('[^a-zA-Z]',repl = ' ',string = sms_data['v2'][i])
    s1.lower()
    s1 = s1.split()
    s1 = [stemming.stem(word) for word in s1 if word not in
set(stopwords.words('english'))]
    s1 = ' '.join(s1)
    corpus.append(s1)

from sklearn.feature_extraction.text import CountVectorizer
countvectorizer =CountVectorizer()

x = countvectorizer.fit_transform(corpus).toarray()
print(x)

y = sms_data['v1'].values
print(y)

from sklearn.model_selection import train_test_split
x_train,x_test,y_train,y_test = train_test_split(x,y,test_size = 0.3,
stratify=y,random_state=2)

#Multinomial Naïve Bayes.
from sklearn.naive_bayes import MultinomialNB
multinomialnb = MultinomialNB()
multinomialnb.fit(x_train,y_train)

# Predicting on test data:

y_pred = multinomialnb.predict(x_test)
print(y_pred)

#Results of our Models
```

from sklearn.metrics import classification_report, confusion_matrix
from sklearn.metrics import accuracy_score

print(classification_report(y_test,y_pred))
print("accuracy_score: ",accuracy_score(y_test,y_pred))

input:
spam.csv file from github

output:



```
========= RESTART: D:\2020\NLP\Practical\uni\p9NaiveBayesClassifier.py =========
[[0 0 1 0 0 0 1 0 0 1 1 0 0 0 0 1 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0
  1 1 0 0 0 0 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0
  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 1 0]
 [0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
  0 0 0 0 0 1 0 0 0 1 0 0 0 0 0 0 0 0 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0]
 [0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 1 0 0 0 0 2 0 2 1 1 0 0 0 0 0
  0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 0 1 0 0 0 0 0 0
  0 0 1 1 0 0 1 0 0 0 1 0 0 1 0 0 0 0 0 0 0 1 0 1 0 0 0]
 [0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 0 0 0 0 0 0 0 0 0 0
  0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 0 0
  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0]
 [0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1
  0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
  0 0 0 0 0 0 0 0 1 1 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0]
 [0 0 0 0 0 0 0 1 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 1 0 1 0 0
  0 0 1 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 1
  0 0 0 1 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 1 0 1]
 [1 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0
  0 0 0 0 0 0 0 0 0 0 2 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0
  0 1 0 0 0 0 0 1 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0]
 [0 0 0 0 0 1 0 0 0 0 0 0 1 2 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0
  0 0 0 0 0 0 0 0 0 0 0 0 0 2 1 0 0 1 0 0 1 0 1 0 1 0 0 0 0 0 0 1 0 0 0 0
  1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0]
 [0 0 0 0 0 1 0 0 0 0 0 1 0 0 0 0 2 1 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0
  0 0 0 0 1 0 0 1 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 1 0 0 0 0 1 0 1 0 1 0
  0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 1 1 0 0 0 0 0 1 0 0 0 0]]
['ham' 'ham' 'spam' 'ham' 'ham' 'spam' 'ham' 'ham' 'spam']
['ham' 'ham' 'ham']
              precision    recall  f1-score   support

         ham       0.67      1.00      0.80         2
        spam       0.00      0.00      0.00         1

    accuracy                           0.67         3
   macro avg       0.33      0.50      0.40         3
weighted avg       0.44      0.67      0.53         3

accuracy_score:  0.6666666666666666
>>> 
```

10. a. Speech Tagging:

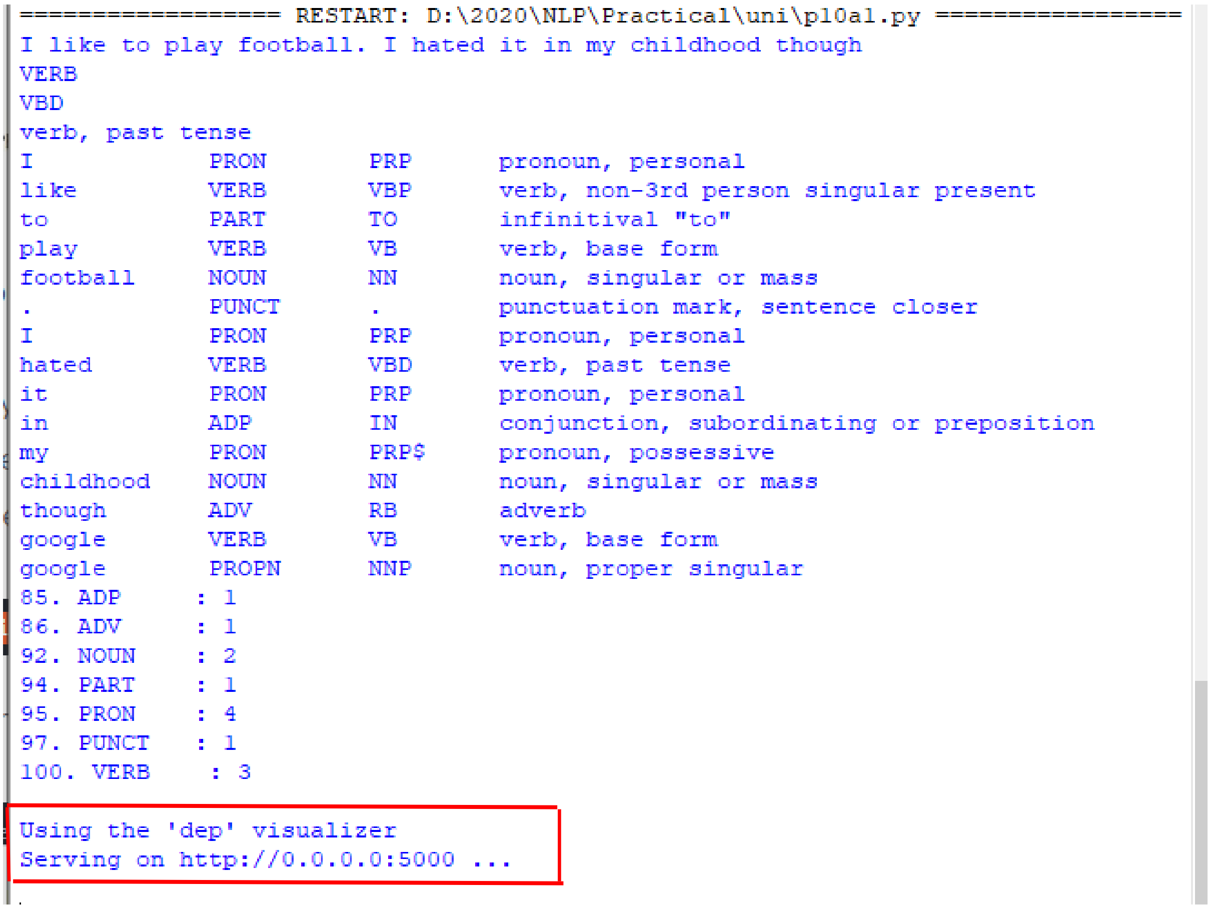
i. Speech tagging using spacy

Code

!pip install displacy

```
import spacy
sp = spacy.load('en_core_web_sm')
sen = sp(u"I like to play football. I hated it in my childhood though")
print(sen.text)
print(sen[7].pos_)
print(sen[7].tag_)
print(spacy.explain(sen[7].tag_))
for word in sen:
   print(f'{word.text:{12}} {word.pos_:{10}} {word.tag_:{8}}
{spacy.explain(word.tag_)}')


sen = sp(u'Can you google it?')
word = sen[2]

print(f'{word.text:{12}} {word.pos_:{10}} {word.tag_:{8}}
{spacy.explain(word.tag_)}')
sen = sp(u'Can you search it on google?')
word = sen[5]

print(f'{word.text:{12}} {word.pos_:{10}} {word.tag_:{8}}
{spacy.explain(word.tag_)}')

#Finding the Number of POS Tags
sen = sp(u"I like to play football. I hated it in my childhood though")

num_pos = sen.count_by(spacy.attrs.POS)
num_pos

for k,v in sorted(num_pos.items()):
   print(f'{k}. {sen.vocab[k].text:{8}}: {v}')

#Visualizing Parts of Speech Tags
from spacy import displacy

sen = sp(u"I like to play football. I hated it in my childhood though")
displacy.serve(sen, style='dep', options={'distance': 120})
```

output:



```
================== RESTART: D:\2020\NLP\Practical\uni\p10a1.py =================
I like to play football. I hated it in my childhood though
VERB
VBD
verb, past tense
I             PRON      PRP      pronoun, personal
like          VERB      VBP      verb, non-3rd person singular present
to            PART      TO       infinitival "to"
play          VERB      VB       verb, base form
football      NOUN      NN       noun, singular or mass
.             PUNCT     .        punctuation mark, sentence closer
I             PRON      PRP      pronoun, personal
hated         VERB      VBD      verb, past tense
it            PRON      PRP      pronoun, personal
in            ADP       IN       conjunction, subordinating or preposition
my            PRON      PRP$     pronoun, possessive
childhood     NOUN      NN       noun, singular or mass
though        ADV       RB       adverb
google        VERB      VB       verb, base form
google        PROPN     NNP      noun, proper singular
85. ADP     : 1
86. ADV     : 1
92. NOUN    : 2
94. PART    : 1
95. PRON    : 4
97. PUNCT   : 1
100. VERB    : 3

Using the 'dep' visualizer
Serving on http://0.0.0.0:5000 ...
```

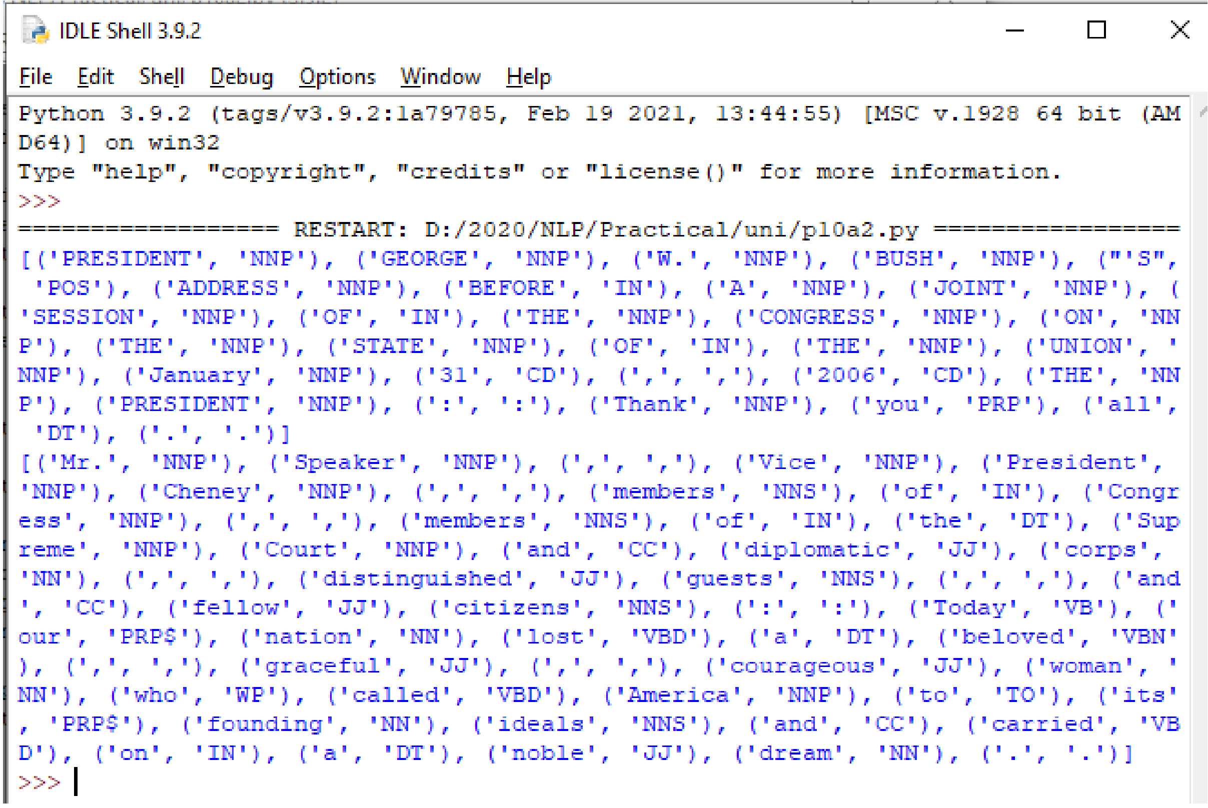
To view the dependency tree, type the following address in your browser: http://127.0.0.1:5000/. You will see the following dependency tree:

ii. Speech tagging using nktl

code:

```
import nltk
from nltk.corpus import state_union
from nltk.tokenize import PunktSentenceTokenizer

#create our training and testing data:
train_text = state_union.raw("2005-GWBush.txt")
sample_text = state_union.raw("2006-GWBush.txt")

#train the Punkt tokenizer like:
custom_sent_tokenizer = PunktSentenceTokenizer(train_text)

# tokenize:
tokenized = custom_sent_tokenizer.tokenize(sample_text)

def process_content():
    try:
        for i in tokenized[:2]:
            words = nltk.word_tokenize(i)
            tagged = nltk.pos_tag(words)
            print(tagged)

        except Exception as e:
            print(str(e))


process_content()
```

output:



```
Python 3.9.2 (tags/v3.9.2:1a79785, Feb 19 2021, 13:44:55) [MSC v.1928 64 bit (AM
D64)] on win32
Type "help", "copyright", "credits" or "license()" for more information.
>>> 
================== RESTART: D:/2020/NLP/Practical/uni/p10a2.py =================
[('PRESIDENT', 'NNP'), ('GEORGE', 'NNP'), ('W.', 'NNP'), ('BUSH', 'NNP'), ("'S",
 'POS'), ('ADDRESS', 'NNP'), ('BEFORE', 'IN'), ('A', 'NNP'), ('JOINT', 'NNP'), (
'SESSION', 'NNP'), ('OF', 'IN'), ('THE', 'NNP'), ('CONGRESS', 'NNP'), ('ON', 'NN
P'), ('THE', 'NNP'), ('STATE', 'NNP'), ('OF', 'IN'), ('THE', 'NNP'), ('UNION', '
NNP'), ('January', 'NNP'), ('31', 'CD'), (',', ','), ('2006', 'CD'), ('THE', 'NN
P'), ('PRESIDENT', 'NNP'), (':', ':'), ('Thank', 'NNP'), ('you', 'PRP'), ('all',
 'DT'), ('.', '.')]
[('Mr.', 'NNP'), ('Speaker', 'NNP'), (',', ','), ('Vice', 'NNP'), ('President',
'NNP'), ('Cheney', 'NNP'), (',', ','), ('members', 'NNS'), ('of', 'IN'), ('Congr
ess', 'NNP'), (',', ','), ('members', 'NNS'), ('of', 'IN'), ('the', 'DT'), ('Sup
reme', 'NNP'), ('Court', 'NNP'), ('and', 'CC'), ('diplomatic', 'JJ'), ('corps',
'NN'), (',', ','), ('distinguished', 'JJ'), ('guests', 'NNS'), (',', ','), ('and
', 'CC'), ('fellow', 'JJ'), ('citizens', 'NNS'), (':', ':'), ('Today', 'VB'), ('
our', 'PRP$'), ('nation', 'NN'), ('lost', 'VBD'), ('a', 'DT'), ('beloved', 'VBN'
), (',', ','), ('graceful', 'JJ'), (',', ','), ('courageous', 'JJ'), ('woman', '
NN'), ('who', 'WP'), ('called', 'VBD'), ('America', 'NNP'), ('to', 'TO'), ('its'
, 'PRP$'), ('founding', 'NN'), ('ideals', 'NNS'), ('and', 'CC'), ('carried', 'VB
D'), ('on', 'IN'), ('a', 'DT'), ('noble', 'JJ'), ('dream', 'NN'), ('.', '.')]
>>> 
```

b. Statistical parsing:

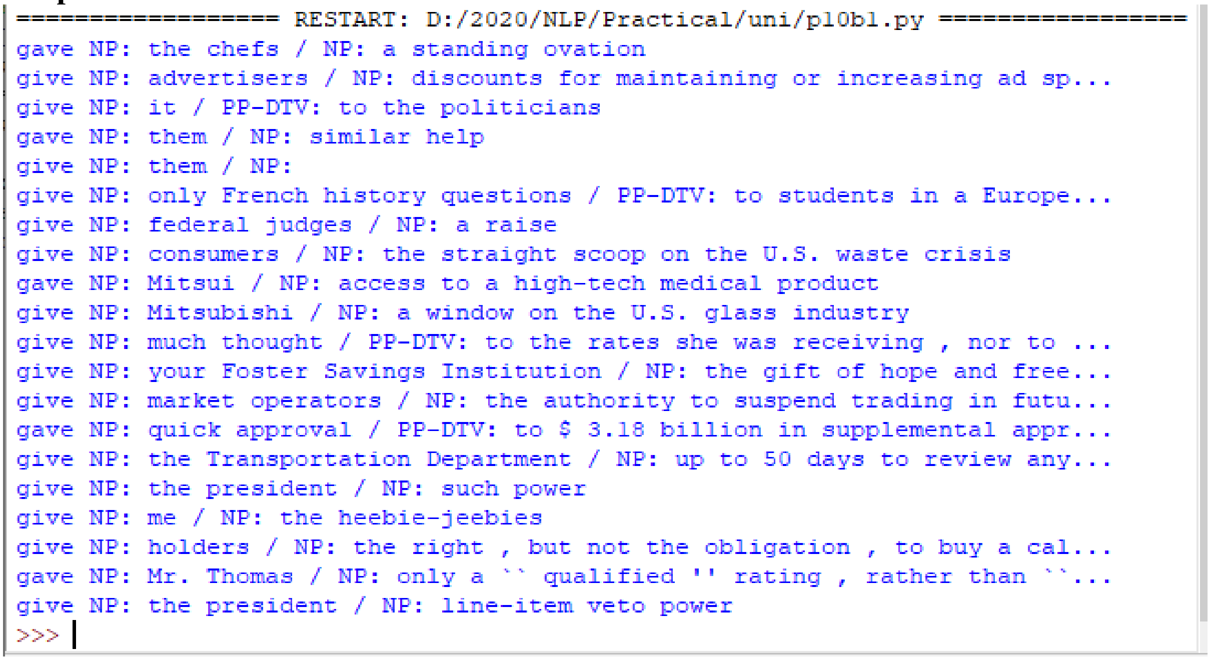
i. Usage of Give and Gave in the Penn Treebank sample

Source code:

```
#probabilitistic parser
#Usage of Give and Gave in the Penn Treebank sample

import nltk
nltk.download('treebank')
import nltk.parse.viterbi
import nltk.parse.pchart
def give(t):
  return t.label() == 'VP' and len(t) > 2 and t[1].label() == 'NP' and (t[2].label() == 'PP-DTV' or t[2].label() ==
'NP') and ('give' in t[0].leaves() or 'gave' in t[0].leaves())


def sent(t):
  return ' '.join(token for token in t.leaves() if token[0] not in '*-0')
```

```
def print_node(t, width):
  output = "%s %s: %s / %s: %s" %\
(sent(t[0]), t[1].label(), sent(t[1]), t[2].label(), sent(t[2]))
  if len(output) > width:
    output = output[:width] + "..."
  print(output)

for tree in nltk.corpus.treebank.parsed_sents():
  for t in tree.subtrees(give):
    print_node(t, 72)
```

Output:



```
=================== RESTART: D:/2020/NLP/Practical/uni/p10b1.py ==================
gave NP: the chefs / NP: a standing ovation
give NP: advertisers / NP: discounts for maintaining or increasing ad sp...
give NP: it / PP-DTV: to the politicians
gave NP: them / NP: similar help
give NP: them / NP:
give NP: only French history questions / PP-DTV: to students in a Europe...
give NP: federal judges / NP: a raise
give NP: consumers / NP: the straight scoop on the U.S. waste crisis
gave NP: Mitsui / NP: access to a high-tech medical product
give NP: Mitsubishi / NP: a window on the U.S. glass industry
give NP: much thought / PP-DTV: to the rates she was receiving , nor to ...
give NP: your Foster Savings Institution / NP: the gift of hope and free...
give NP: market operators / NP: the authority to suspend trading in futu...
gave NP: quick approval / PP-DTV: to $ 3.18 billion in supplemental appr...
give NP: the Transportation Department / NP: up to 50 days to review any...
give NP: the president / NP: such power
give NP: me / NP: the heebie-jeebies
give NP: holders / NP: the right , but not the obligation , to buy a cal...
gave NP: Mr. Thomas / NP: only a `` qualified '' rating , rather than ``...
give NP: the president / NP: line-item veto power
>>> |
```

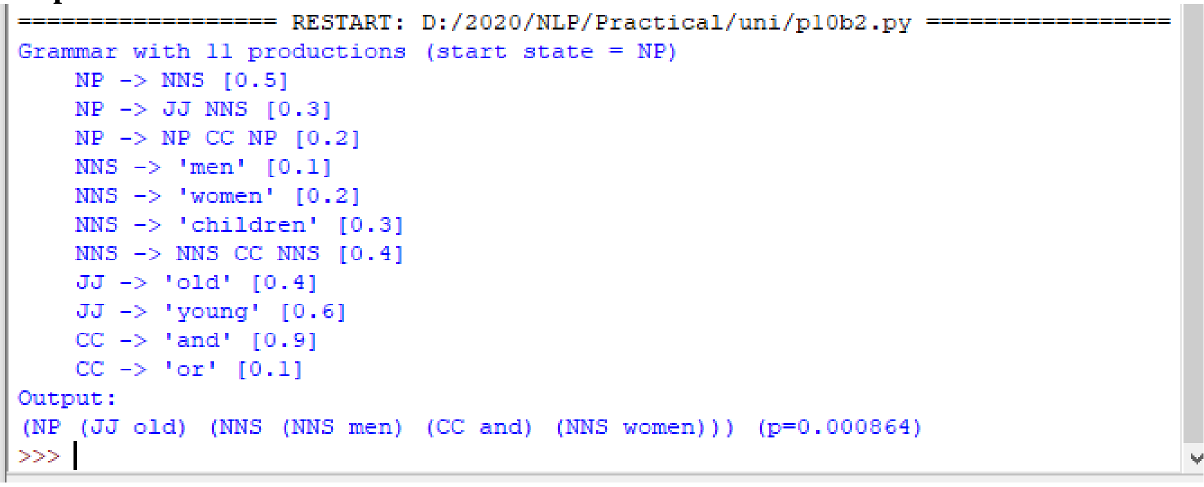
ii. probabilistic parser

Source code:

```
import nltk
from nltk import PCFG

grammar = PCFG.fromstring('''
NP -> NNS [0.5] | JJ NNS [0.3] | NP CC NP [0.2]
NNS -> "men" [0.1] | "women" [0.2] | "children" [0.3] | NNS CC NNS [0.4]
JJ -> "old" [0.4] | "young" [0.6]
CC -> "and" [0.9] | "or" [0.1]
''')

print(grammar)

viterbi_parser = nltk.ViterbiParser(grammar)

token = "old men and women".split()

obj = viterbi_parser.parse(token)
```

```
print("Output: ")
for x in obj:
    print(x)
```

Output:



```
================== RESTART: D:/2020/NLP/Practical/uni/p10b2.py =================
Grammar with 11 productions (start state = NP)
    NP -> NNS [0.5]
    NP -> JJ NNS [0.3]
    NP -> NP CC NP [0.2]
    NNS -> 'men' [0.1]
    NNS -> 'women' [0.2]
    NNS -> 'children' [0.3]
    NNS -> NNS CC NNS [0.4]
    JJ -> 'old' [0.4]
    JJ -> 'young' [0.6]
    CC -> 'and' [0.9]
    CC -> 'or' [0.1]
Output:
(NP (JJ old) (NNS (NNS men) (CC and) (NNS women))) (p=0.000864)
>>> |
```

c. Malt parsing:

Parse a sentence and draw a tree using malt parsing.

Note: 1) Java should be installed.

2) maltparser-1.7.2 zip file should be copied in C:\Users\Beena Kapadia\AppData\Local\Programs\Python\Python39 folder and should be extracted in the same folder.

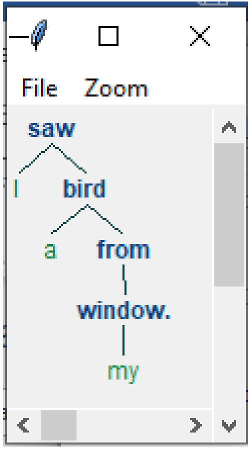
3) engmalt.linear-1.7.mco file should be copied to C:\Users\Beena Kapadia\AppData\Local\Programs\Python\Python39 folder

Source code:

```
# copy maltparser-1.7.2(unzipped version) and engmalt.linear-1.7.mco files to C:\Users\Beena Kapadia\AppData\Local\Programs\Python\Python39 folder
# java should be installed
# environment variables should be set - MALT_PARSER - C:\Users\Beena Kapadia\AppData\Local\Programs\Python\Python39\maltparser-1.7.2 and MALT_MODEL - C:\Users\Beena Kapadia\AppData\Local\Programs\Python\Python39\engmalt.linear-1.7.mco

from nltk.parse import malt
mp = malt.MaltParser('maltparser-1.7.2', 'engmalt.linear-1.7.mco')#file
t = mp.parse_one('I saw a bird from my window.'.split()).tree()
print(t)
t.draw()
```

Output:

```
(saw I (bird a (from (window. my))))
```

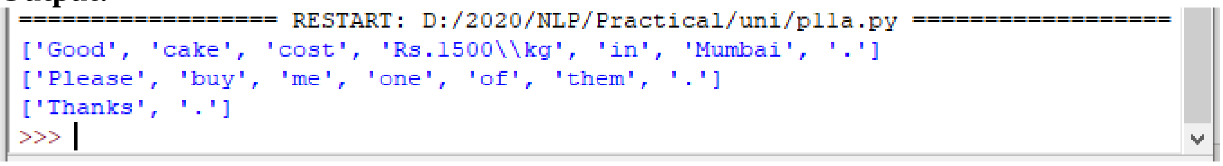


11. a) Multiword Expressions in NLP

Source code:

```
# Multiword Expressions in NLP

from nltk.tokenize import MWETokenizer
from nltk import sent_tokenize, word_tokenize
s = '''Good cake cost Rs.1500\kg in Mumbai. Please buy me one of them.\n\nThanks.'''
mwe = MWETokenizer([('New', 'York'), ('Hong', 'Kong')], separator='_')
for sent in sent_tokenize(s):
    print(mwe.tokenize(word_tokenize(sent)))
```

Output:



```
================== RESTART: D:/2020/NLP/Practical/uni/p11a.py ==================
['Good', 'cake', 'cost', 'Rs.1500\\kg', 'in', 'Mumbai', '.']
['Please', 'buy', 'me', 'one', 'of', 'them', '.']
['Thanks', '.']
>>> 
```

b) Normalized Web Distance and Word Similarity

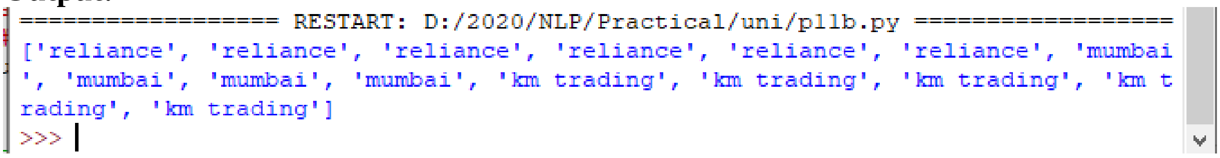
Source code:

```
# Normalized Web Distance and Word Similarity

#convert

#Reliance  supermarket
#Reliance hypermarket
#Reliance
#Reliance
#Reliance downtown
#Relianc market
#Mumbai
#Mumbai Hyper
#Mumbai dxb
#mumbai airport
#k.m trading
#KM Trading
#KM trade
#K.M. Trading
#KM.Trading

#into

#Reliance
#Reliance
#Reliance
#Reliance
#Reliance
#Reliance
#Mumbai
#Mumbai
#Mumbai
#Mumbai
```

```
#KM Trading
#KM Trading
#KM Trading
#KM Trading
#KM Trading
```

```
import numpy as np
import re
import textdistance # pip install textdistance
# we will need scikit-learn>=0.21
import sklearn #pip install sklearn
from sklearn.cluster import AgglomerativeClustering

texts = [
  'Reliance supermarket', 'Reliance hypermarket', 'Reliance', 'Reliance', 'Reliance
downtown', 'Relianc market',
   'Mumbai', 'Mumbai Hyper', 'Mumbai dxb', 'mumbai airport',
  'k.m trading', 'KM Trading', 'KM trade', 'K.M.  Trading', 'KM.Trading'
]

def normalize(text):
  """ Keep only lower-cased text and numbers"""
  return re.sub('[^a-z0-9]+', ' ', text.lower())

def group_texts(texts, threshold=0.4):
  """ Replace each text with the representative of its cluster"""
  normalized_texts = np.array([normalize(text) for text in texts])
  distances = 1 - np.array([
      [textdistance.jaro_winkler(one, another) for one in normalized_texts]
      for another in normalized_texts
  ])
  clustering = AgglomerativeClustering(
    distance_threshold=threshold, # this parameter needs to be tuned carefully
    affinity="precomputed", linkage="complete", n_clusters=None
  ).fit(distances)
  centers = dict()
  for cluster_id in set(clustering.labels_):
    index = clustering.labels_ == cluster_id
    centrality = distances[:, index][index].sum(axis=1)
  centers[cluster_id] = normalized_texts[index][centrality.argmin()]
  return [centers[i] for i in clustering.labels_]

print(group_texts(texts))
```

Output:



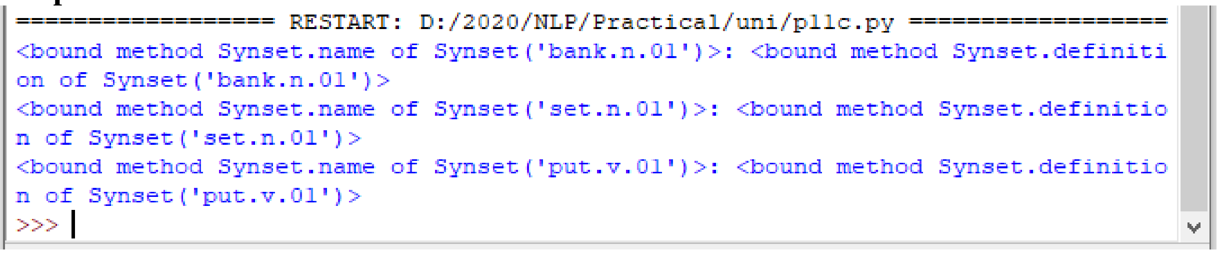
```
================== RESTART: D:/2020/NLP/Practical/uni/p11b.py ==================
['reliance', 'reliance', 'reliance', 'reliance', 'reliance', 'reliance', 'mumbai
', 'mumbai', 'mumbai', 'mumbai', 'km trading', 'km trading', 'km trading', 'km t
rading', 'km trading']
>>> 
```

c) Word Sense Disambiguation

Source code:

```
#Word Sense Disambiguation
from nltk.corpus import wordnet as wn

def get_first_sense(word, pos=None):
   if pos:
      synsets = wn.synsets(word,pos)
   else:
      synsets = wn.synsets(word)
   return synsets[0]

best_synset = get_first_sense('bank')
print ('%s: %s' % (best_synset.name, best_synset.definition))
best_synset = get_first_sense('set','n')
print ('%s: %s' % (best_synset.name, best_synset.definition))
best_synset = get_first_sense('set','v')
print ('%s: %s' % (best_synset.name, best_synset.definition))
```

Output:



```
================== RESTART: D:/2020/NLP/Practical/uni/pllc.py ==================
<bound method Synset.name of Synset('bank.n.01')>: <bound method Synset.definiti
on of Synset('bank.n.01')>
<bound method Synset.name of Synset('set.n.01')>: <bound method Synset.definitio
n of Synset('set.n.01')>
<bound method Synset.name of Synset('put.v.01')>: <bound method Synset.definitio
n of Synset('put.v.01')>
>>> 
```

Practical No. 9

Implement Naive Bayes classifierCode:

#pip install pandas#pip install