EXPERIMENT 13

Implementation of NLP problem

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AIM: To Implement NLP programs.

LANGUAGE: Python

THEORY:-

NLP stands for Natural Language Processing, which is a part of Computer Science, Human language, and Artificial Intelligence. It is the technology that is used by machines to understand, analyse, manipulate, and interpret human's languages. It helps developers to organize knowledge for performing tasks such as translation, automatic summarization, Named Entity Recognition (NER), speech recognition, relationship extraction, and topic segmentation.

CODE:-

```
import pandas as pd
import sqlite3
import regex as re
import matplotlib.pyplot as plt

from wordcloud import WordCloud df =
pd.read_csv('emails.csv')
```

```
print("spam count: " +str(len(df.loc[df.spam==1])))
print("not spam count: " +str(len(df.loc[df.spam==0])))
print(df.shape)
df['spam'] =df['spam'].astype(int)

df =df.drop_duplicates() print(df.shape)

df.head()

df =df.reset_index(inplace =False)[['text','spam']]

print(df.shape) df['spam'].unique() df.head()

clean_desc =[]
for w in range(len(df.text)):

desc =df['text'][w].lower() #remove punctuation

desc =re.sub('[^a-zA-Z]', ' ', desc) #remove tags

desc=re.sub("&lt;/?.*?&gt;"," &lt;&gt; ",desc) #remove
digits and special chars

desc=re.sub("(\\d|\\W)+"," ",desc)

clean_desc.append(desc)

#assign the cleaned descriptions to the data frame

df['text'] =clean_desc df =df.reset_index() df.head(3)

df1 =df.loc[df.spam==0]
df2 =df.loc[df.spam==1]
stop_words =['is','you','your','and', 'the', 'to',
'from', 'or', 'I', 'for', 'do', 'get', 'not', 'here',
'in', 'im', 'have', 'on', 're', 'new', 'subject']
#set the word cloud parameters
wordcloud =WordCloud(width =800, height =800,
background_color ='black', stopwords =stop_words,
max_words =1000

#plot the word cloud
, min_font_size =20).generate(str(df['text']))
```

```
fig =plt.figure(figsize =(8,8), facecolor =None)
plt.imshow(wordcloud)
plt.axis('off')
plt.show()

, min_font_size =20).generate(str(df2['text']))

fig =plt.figure(figsize =(8,8), facecolor =None)
plt.imshow(wordcloud)
plt.axis('off')
plt.show()

from sklearn.feature_extraction.text import
CountVectorizer

wordcloud =WordCloud(width =800, height =800,
background_color ='black', stopwords =stop_words,
max_words =1000

#plot the word cloud
from sklearn.model_selection import train_test_split
from sklearn import ensemble
from sklearn.metrics import classification_report,
accuracy_score

text =["the dog is white", "the cat is black", "the
cat and the dog are friends"]

#list of sentences
#instantiate the class
cv =CountVectorizer()
# tokenize and build vocab

cv.fit(text) # summarize

print(cv.vocabulary_) # encode document

vector =cv.transform(text) # summarize encoded vector

print(vector.toarray())
from sklearn.feature_extraction.text import
CountVectorizer
```

```
text_vec = CountVectorizer().fit_transform(df['text'])

from sklearn.model_selection import train_test_split
X_train, X_test, y_train, y_test =
train_test_split(text_vec,

df['spam'], test_size = 0.45 42, shuffle = True)

from sklearn import ensemble
classifier = ensemble.GradientBoostingClassifier(

, random_state =

# #

max_depth = 6,  min_samples_split = 21, min_samples_leaf = 19,

#max_features = 0.9,
#loss = 'huber'
n_estimators = 100,  #how many decision trees to build

learning_rate = 0.5,  #controls rate at which additional decision trees
influes overall prediction

)
classifier.fit(X_train, y_train)
predictions = classifier.predict(X_test)
print(classification_report(y_test, predictions))

from sklearn.metrics import
classification_report,confusion_matrix, accuracy_score
pred = classifier.predict(X_train)
print(classification_report(y_train ,pred ))

print('Confusion Matrix:
\n',confusion_matrix(y_train,pred)) print()
print('Accuracy: ', accuracy_score(y_train,pred))

pred = classifier.predict(X_test)
print(classification_report(y_test ,pred ))
print('Confusion Matrix: \n',
confusion_matrix(y_test,pred))

print()
print('Accuracy: ', accuracy_score(y_test,pred))
```

```
from textblob import TextBlob

email_blob = [TextBlob(text) for text in df['text']]
#add the sentiment metrics to the dataframe
df['tb_Pol'] = [b.sentiment.polarity for b in email_blob]
df['tb_Subj'] = [b.sentiment.subjectivity for b in
email_blob] #show dataframe

df.head(3)
```

OUTPUT:

#load the descriptions into textblob

```
[4] df = pd.read_csv('emails.csv')
    df.head()
```

	text	spam
0	Subject: naturally irresistible your corporate...	1
1	Subject: the stock trading gunslinger fanny i...	1
2	Subject: unbelievable new homes made easy im ...	1
3	Subject: 4 color printing special request add...	1
4	Subject: do not have money , get software cds ...	1

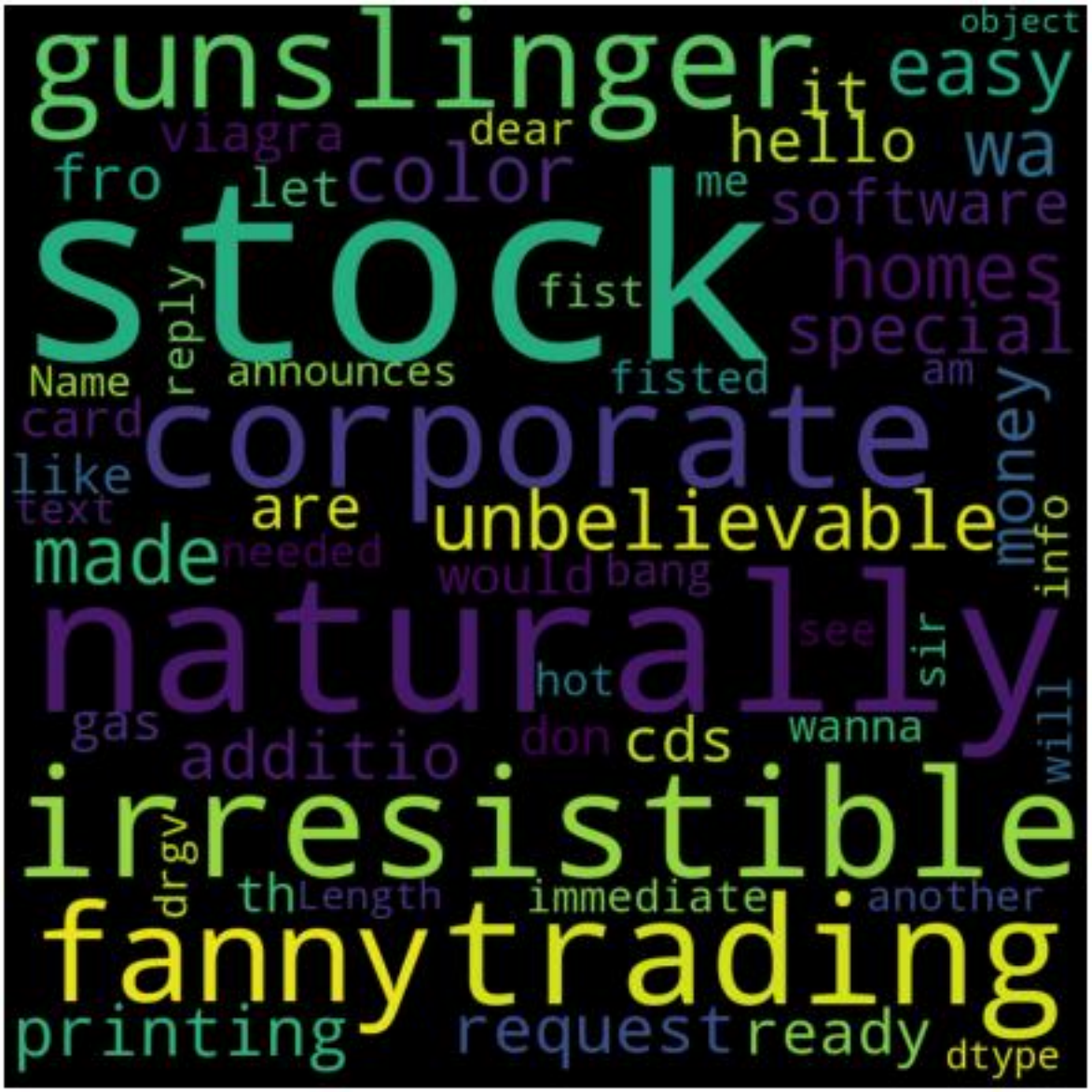
```
spam count: 1368
not spam count: 4360
(5728, 2)
(5695, 2)
```

```
print(df.shape)
df['spam'].unique()
df.head()
```

```
(5695, 2)
```

	index	text	spam
0	0	subject naturally irresistible your corporate ...	1
1	1	subject the stock trading gunslinger fanny is ...	1
2	2	subject unbelievable new homes made easy im wa...	1


all
trading
easy
text
fanny
development
interest
cds
fro
Length
update
research
agai
special
corporate
additio
unbelievable
gunslinger
aurora
call
david
object
charges
enron
wa
please
news
thanks
request
visit
homes
study
color
dtype
stock
money
naturally
shirley
jim
receipts
made
version
case
printing
software
Name
irresistible
wow




```
#instantiate the class
cv = CountVectorizer()

# tokenize and build vocab
cv.fit(text)

# summarize
print(cv.vocabulary_)

# encode document
vector = cv.transform(text)

# summarize encoded vector
print(vector.toarray())
```

```
{'the': 7, 'dog': 4, 'is': 6, 'white': 8, 'cat': 3, 'black': 2, 'and': 0, 'are': 1, 'friends': 5}
[[0 0 0 0 1 0 1 1 1]
 [0 0 1 1 0 0 1 1 0]
 [1 1 0 1 1 1 0 2 0]]
```

```
classifier.fit(X_train, y_train)

predictions = classifier.predict(X_test)

print(classification_report(y_test, predictions))
```

```
              precision    recall  f1-score   support

           0       0.97      0.99      0.98      1926
           1       0.98      0.90      0.94       637

    accuracy                           0.97      2563
   macro avg       0.98      0.95      0.96      2563
weighted avg       0.97      0.97      0.97      2563
```

```
from sklearn.metrics import classification_report,confusion_matrix, accuracy_score
pred = classifier.predict(X_train)
print(classification_report(y_train ,pred ))
print('Confusion Matrix: \n',confusion_matrix(y_train,pred))
print()
print('Accuracy: ', accuracy_score(y_train,pred))
```

```
              precision    recall  f1-score   support

           0       1.00      1.00      1.00      2401
           1       1.00      1.00      1.00       731

    accuracy                           1.00      3132
   macro avg       1.00      1.00      1.00      3132
weighted avg       1.00      1.00      1.00      3132

Confusion Matrix:
 [[2401    0]
 [   0  731]]

Accuracy:  1.0
```

```
pred = classifier.predict(X_test)
print(classification_report(y_test ,pred ))
print('Confusion Matrix: \n', confusion_matrix(y_test,pred))

print()
print('Accuracy: ', accuracy_score(y_test,pred))
```

```
              precision    recall  f1-score   support

           0       0.97      0.99      0.98      1926
           1       0.98      0.90      0.94       637

    accuracy                           0.97      2563
   macro avg       0.98      0.95      0.96      2563
weighted avg       0.97      0.97      0.97      2563

Confusion Matrix:
 [[1916   10]
 [  64  573]]

Accuracy:  0.9711275848614904
```

```
from textblob import TextBlob

#load the descriptions into textblob
email_blob = [TextBlob(text) for text in df['text']]
#add the sentiment metrics to the dataframe
df['tb_Pol'] = [b.sentiment.polarity for b in email_blob]
df['tb_Subj'] = [b.sentiment.subjectivity for b in email_blob]
#show dataframe
df.head(3)
```

	index	text	spam	tb_Pol	tb_Subj
0	0	subject naturally irresistible your corporate ...	1	0.296607	0.546905
1	1	subject the stock trading gunslinger fanny is ...	1	0.160317	0.562698
2	2	subject unbelievable new homes made easy im wa...	1	0.040229	0.480581

RESULT: Thus, successfully implemented NLP problem.