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ARTIFICIAL INTELLIGENCE (18CSC305J) LAB

EXPERIMENT 13: Implementation of NLP problem

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**.

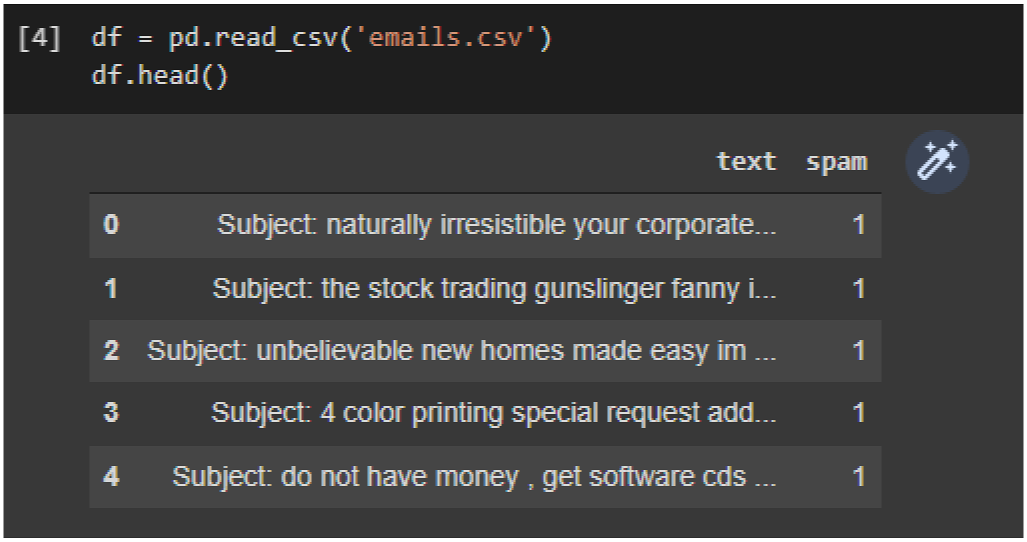
CODE:

```
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')
df.head()

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 = 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
                      , min_font_size = 20).generate(str(df['text']))
#plot the word cloud
fig = plt.figure(figsize = (8,8), facecolor = None)
plt.imshow(wordcloud)
plt.axis('off')
plt.show()

wordcloud = WordCloud(width = 800, height = 800, background_color =
'black', stopwords = stop_words, max_words = 1000
                      , min_font_size = 20).generate(str(df2['text']))
#plot the word cloud
fig = plt.figure(figsize = (8,8), facecolor = None)
plt.imshow(wordcloud)
plt.axis('off')
plt.show()

from sklearn.feature_extraction.text import CountVectorizer
from sklearn.model_selection import train_test_split
from sklearn import ensemble
from sklearn.metrics import classification_report, accuracy_score

#list of sentences
text = ["the dog is white", "the cat is black", "the cat and the dog
are friends"]

#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
                                                    , random_state =
42, shuffle = True)

from sklearn import ensemble
classifier = ensemble.GradientBoostingClassifier(
    n_estimators = 100, #how many decision trees to build
    learning_rate = 0.5, #controls rate at which additional decision
trees influes overall prediction
    max_depth = 6,
#     min_samples_split = 21,
#     min_samples_leaf = 19,
    #max_features = 0.9,
    #loss = 'huber'
)

classifier.fit(X_train, y_train)

predictions = classifier.predict(X_test)

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

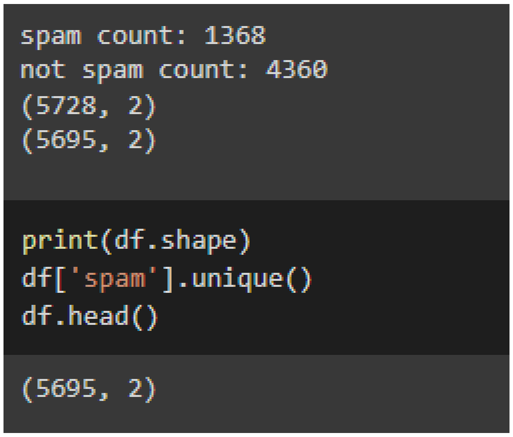
```
from sklearn.metrics import classification_report,confusion_matrix,
accuracy_score
pred = classifier.predict(X_train)
print(classification_report(y_train ,pred ))
print('Confusion Matrix: \n',confusion_matrix(y_train,pred))
print()
print('Accuracy: ', accuracy_score(y_train,pred))

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

#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)
```

OUTPUT:



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

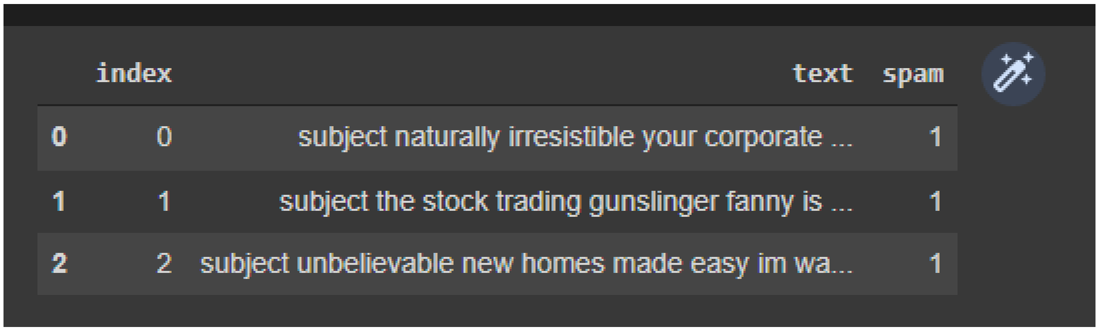
	text	spam
0	Subject: naturally irresistible your corporate...	1
1	Subject: the stock trading gunslinger fanny i...	1
2	Subject: unbelievable new homes made easy im ...	1
3	Subject: 4 color printing special request add...	1
4	Subject: do not have money , get software cds ...	1



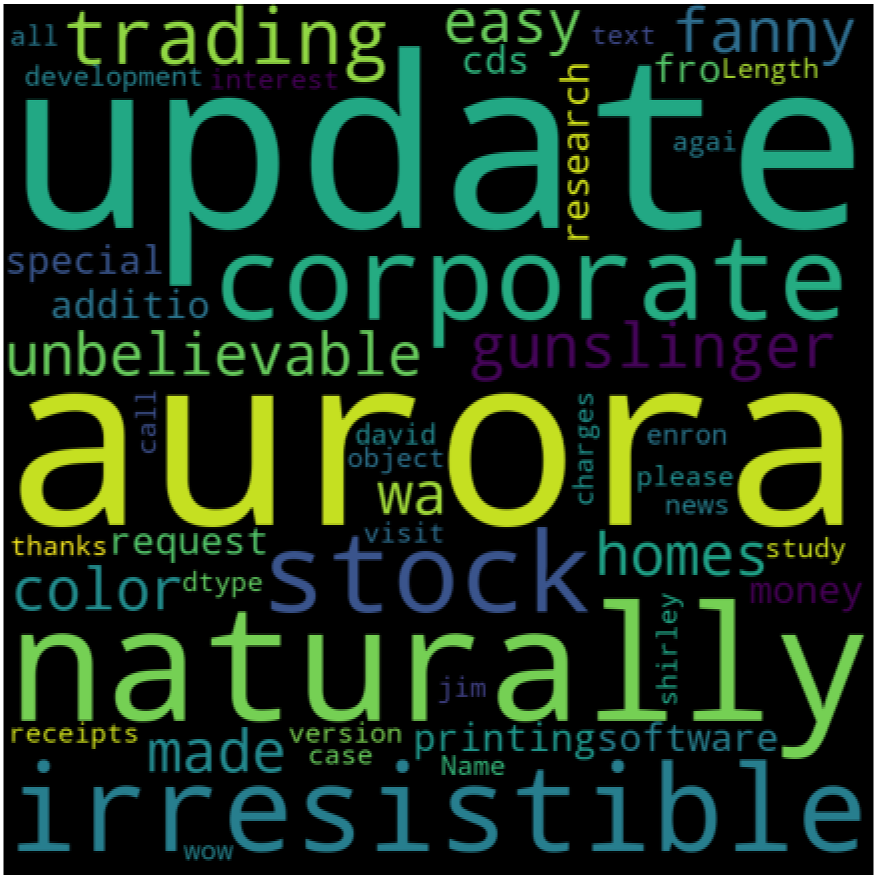
```
spam count: 1368
not spam count: 4360
(5728, 2)
(5695, 2)
```

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

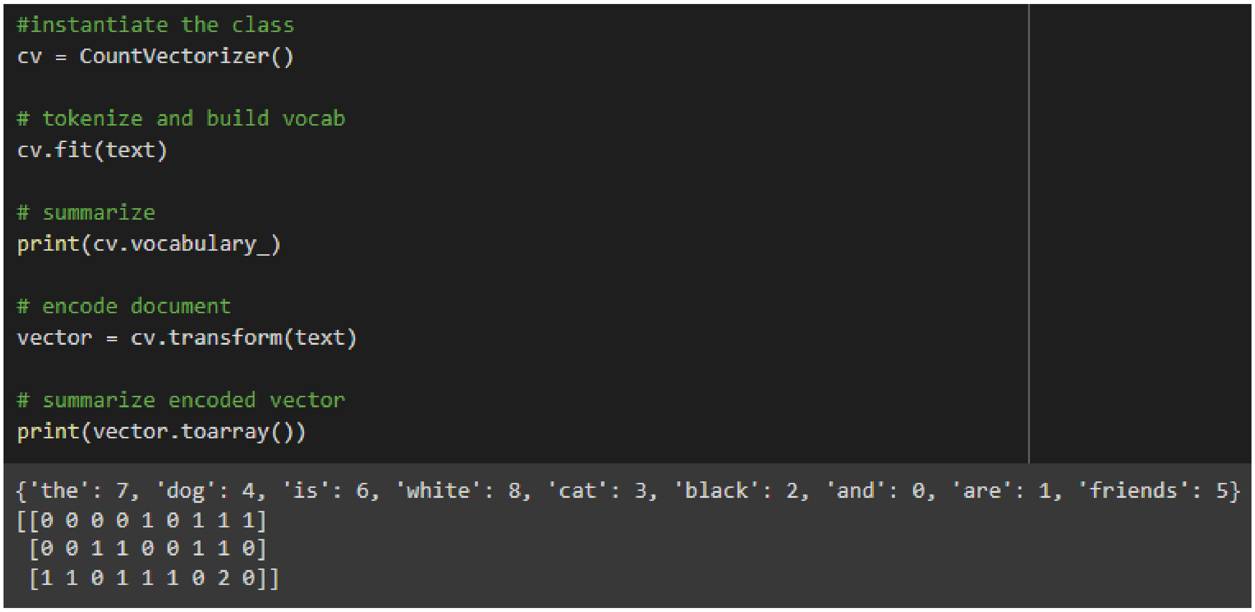
```
(5695, 2)
```



	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

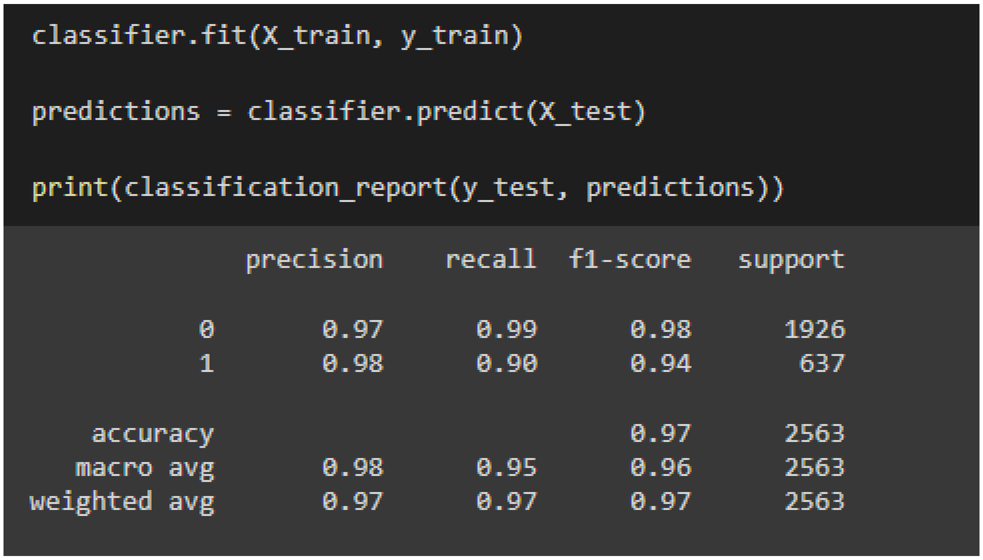


object
gunslinger
it
easy
viagra
dear
hello
wa
fro
let
color
me
software
stock
homes
fist
special
reply
Name
announces
fisted
am
card
corporate
money
like
text
are
unbelievable
info
made
needed
would
bang
naturally
see
sir
hot
gas
additio
don
cds
wanna
will
irresistible
drgv
th
Length
immediate
another
fannytrading
printing
request
ready
dtype



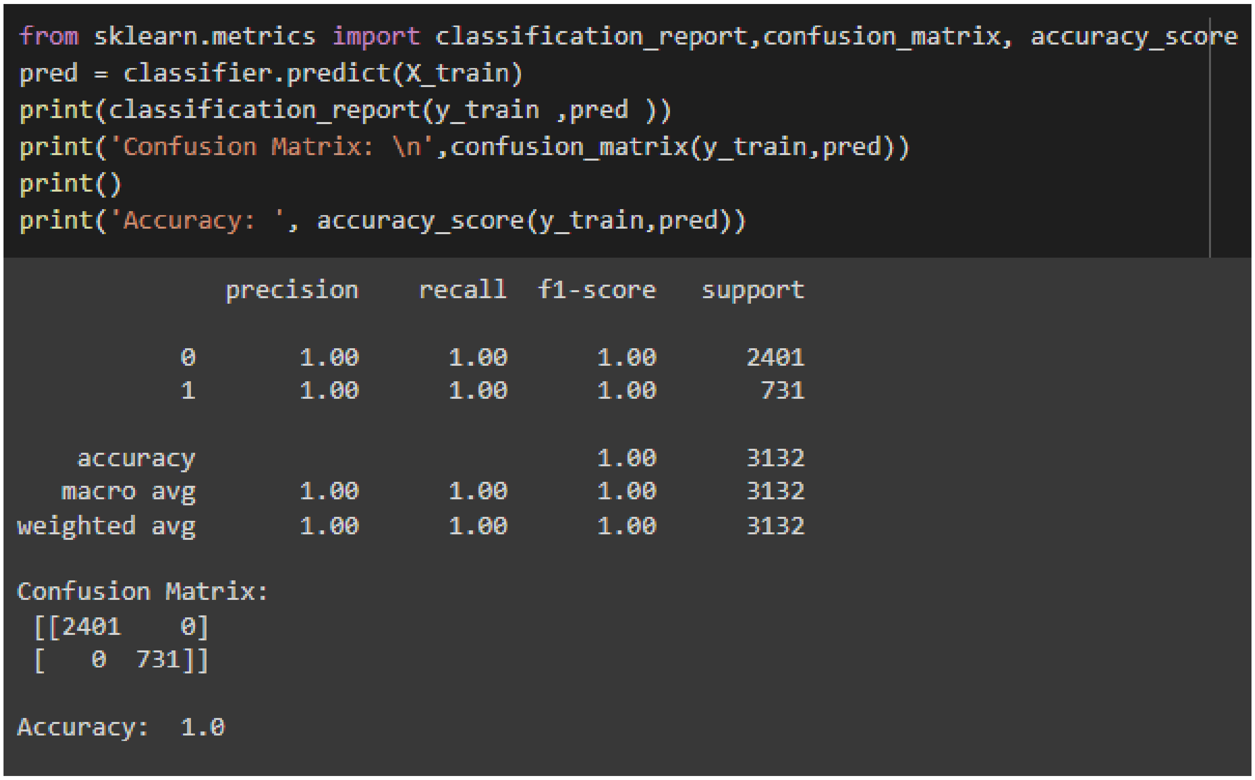
```
#instantiate the class
cv = CountVectorizer()

# 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]]
```



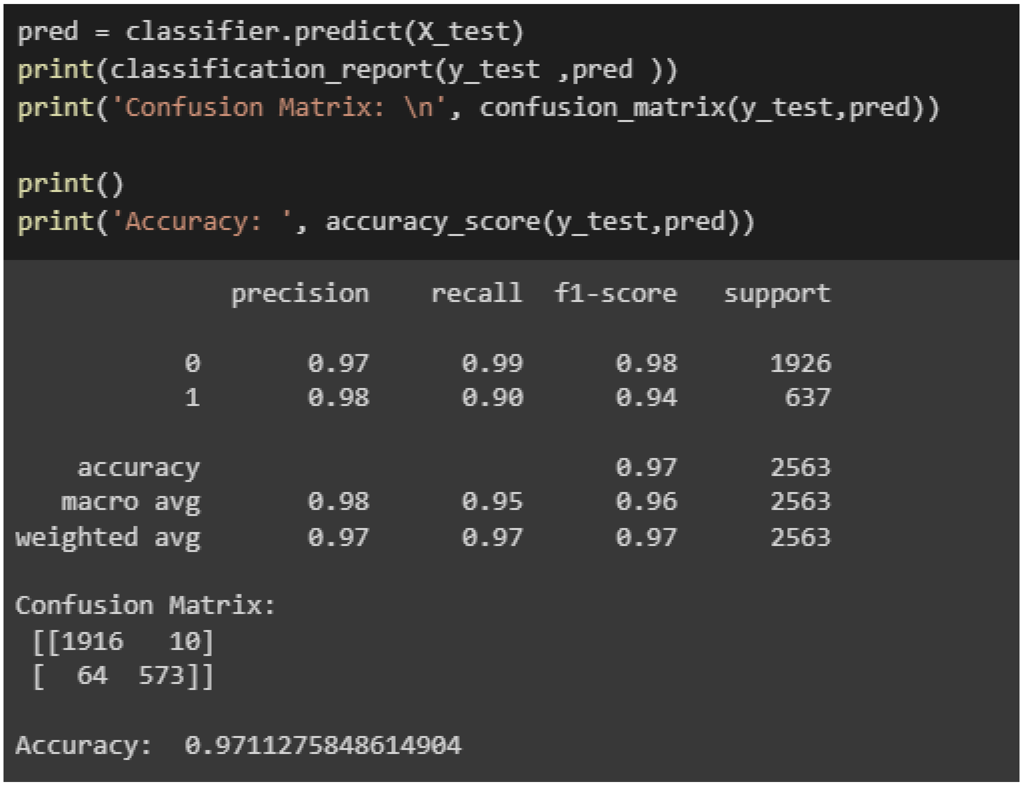
```python
classifier.fit(X_train, y_train)

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
```



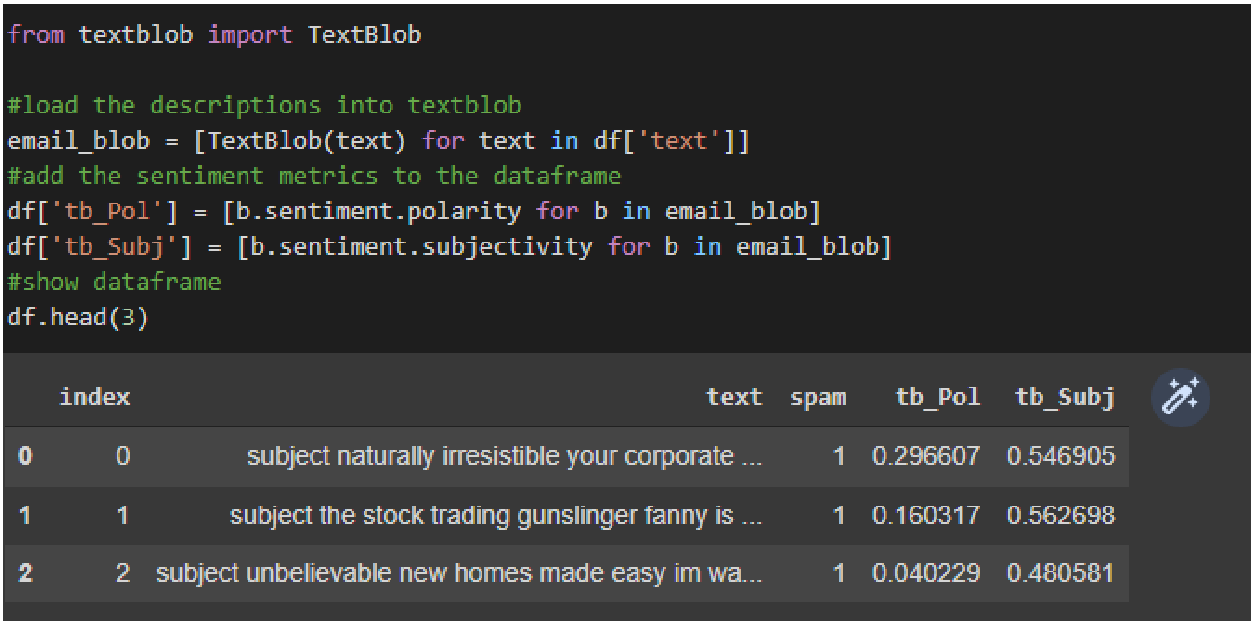
```python
from sklearn.metrics import classification_report,confusion_matrix, accuracy_score
pred = classifier.predict(X_train)
print(classification_report(y_train ,pred ))
print('Confusion Matrix: \n',confusion_matrix(y_train,pred))
print()
print('Accuracy: ', accuracy_score(y_train,pred))
```

```
              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.