Damandeep Singh
00213207218
CSE- 1

MACHINE LEARNING

LAB PROGRAM

Submission -5

Github link : LAB Program -5

EXPERIMENT-5

AIM:

Study and implement the Multinomial Naive Bayes on spam ham dataset

ALGORITHM:

1. In the first step, feature engineering, we focus on extracting features of text. We need numerical features as input for our classifier.
2. In the non-naive Bayes way, we look at sentences in entirety, thus once the sentence does not show up in the training set, we will get a zero probability, making it difficult for further calculations.
3. In the final step, we are good to go : simply calculating the probabilities and compare which has a higher probability

PROGRAM CODE SNIPPET:

LOADING DATA SET:

```
In [1]: import pandas as pd
```

```
In [2]: df = pd.read_csv("spam_ham_dataset.csv")
        df
```

Out[2]:

	Unnamed: 0	label	text	label_num
0	605	ham	Subject: enron methanol ; meter # : 968291\r\n...	0
1	2349	ham	Subject: hpl nom for january 9 , 2001\r\n(see...	0
2	3624	ham	Subject: neon retreat\r\nho ho ho , we ' re ar...	0
3	4685	spam	Subject: photoshop , windows , office . cheap ...	1
4	2030	ham	Subject: re : indian springs\r\nthis deal is t...	0
...	...	...	...	...
5166	1518	ham	Subject: put the 10 on the ft\r\nthe transport...	0
5167	404	ham	Subject: 3 / 4 / 2000 and following noms\r\nhp...	0
5168	2933	ham	Subject: calpine daily gas nomination\r\n>\r\n...	0
5169	1409	ham	Subject: industrial worksheets for august 2000...	0
5170	4807	spam	Subject: important online banking alert\r\ndea...	1

5171 rows × 4 columns

PREPROCESSING:

In [3]:
```
df.head()
```

Out[3]:

	Unnamed: 0	label	text	label_num
0	605	ham	Subject: enron methanol ; meter # : 988291\r\n...	0
1	2349	ham	Subject: hpl nom for january 9 , 2001\r\n(see...	0
2	3624	ham	Subject: neon retreat\r\nho ho ho , we ' re ar...	0
3	4685	spam	Subject: photoshop , windows , office . cheap ...	1
4	2030	ham	Subject: re : indian springs\r\nthis deal is t...	0

In [4]:
```
df.tail()
```

Out[4]:

	Unnamed: 0	label	text	label_num
5166	1518	ham	Subject: put the 10 on the ft\r\nthe transport...	0
5167	404	ham	Subject: 3 / 4 / 2000 and following noms\r\nhp...	0
5168	2933	ham	Subject: calpine daily gas nomination\r\n>\r\n...	0
5169	1409	ham	Subject: industrial worksheets for august 2000...	0
5170	4807	spam	Subject: important online banking alert\r\ndea...	1

In [5]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 5171 entries, 0 to 5170
Data columns (total 4 columns):
 #   Column      Non-Null Count  Dtype 
---  ------      --------------  ----- 
 0   Unnamed: 0  5171 non-null   int64 
 1   label       5171 non-null   object
 2   text        5171 non-null   object
 3   label_num   5171 non-null   int64 
dtypes: int64(2), object(2)
memory usage: 161.7+ KB
```

In [6]:
```
df.shape
```

Out[6]:
```
(5171, 4)
```

In [7]:
```
df.columns.values
```

Out[7]:
```
array(['Unnamed: 0', 'label', 'text', 'label_num'], dtype=object)
```

In [8]:
```
df.corr()
```

Out[8]:

	Unnamed: 0	label_num
Unnamed: 0	1.000000	0.785847
label_num	0.785847	1.000000

VISUALIZATION:

In [10]:
```
df['label_num'].value_counts()
```

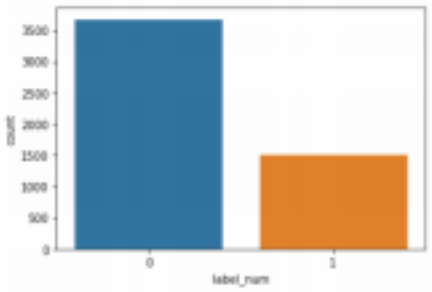
Out[10]:
```
0    3672
1    1499
Name: label_num, dtype: int64
```

In [11]:
```
import matplotlib.pyplot as plt
import seaborn as sns
```

In [12]:
```
sns.countplot(df['label_num'])
```

```
C:\Users\is_dhillon\miniconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a key
word arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an expli
cit keyword will result in an error or misinterpretation.
  warnings.warn(
```

Out[12]:
```
<AxesSubplot:xlabel='label_num', ylabel='count'>
```



In [13]:
```
from sklearn.feature_extraction.text import CountVectorizer
```

In [14]:
```
vector = CountVectorizer()
spam_ham = vector.fit_transform(df['text'])
spam_ham.toarray
```

Out[14]:
```
<bound method _cs_matrix.toarray of <5171x50447 sparse matrix of type '<class 'numpy.int64'>'
        with 456145 stored elements in Compressed Sparse Row format>>
```

In [15]:
```
x =spam_ham
y= df['label_num'].values
y
```

Out[15]:
```
array([0, 0, 0, ..., 0, 0, 1], dtype=int64)
```

In [16]:
```
from sklearn.model_selection import train_test_split
xtrain,xtest,ytrain,ytest = train_test_split(x,y,test_size=0.2, random_state=42)
```

In [17]:
```
from sklearn.naive_bayes import MultinomialNB
nb = MultinomialNB()
nb.fit(xtrain,ytrain)
```

Out[17]:
```
MultinomialNB()
```