ML BCSE209L SMS SPAM CLASSIFICATION PROJECT

*Names of all participants: *

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In [1]:
```
import pandas as pd
import numpy as np
import seaborn as sns
import matplotlib.pyplot as plt
```

In [2]:
```
df=pd.read_csv('/Users/zeelmehta/Desktop/SMSSpamCollection.csv', na
df.head()
```

Out[2]:

	label	message
0	ham	Go until jurong point, crazy.. Available only ...
1	ham	Ok lar... Joking wif u oni...
2	spam	Free entry in 2 a wkly comp to win FA Cup fina...
3	ham	U dun say so early hor... U c already then say...
4	ham	Nah I don't think he goes to usf, he lives aro...

In [3]:
```
df.shape
```

Out[3]:
```
(5572, 2)
```

In [4]:
```
df.isnull().sum()
```

Out[4]:
```
label      0
message    0
dtype: int64
```

In [5]:

```
df.describe()
```

Out[5]:

	label	message
count	5572	5572
unique	2	5158
top	ham	Sorry, I'll call later
freq	4825	30

In [6]:

```
df.groupby('label').describe()
```

Out[6]:

	message			
	count	**unique**	**top**	**freq**
label				
ham	4825	4516	Sorry, I'll call later	30
spam	747	642	Please call our customer service representativ...	4

In [7]:

```
df['length']=df['message'].apply(len)
df.head()
```

Out[7]:

	label	message	length
0	ham	Go until jurong point, crazy.. Available only ...	111
1	ham	Ok lar... Joking wif u oni...	29
2	spam	Free entry in 2 a wkly comp to win FA Cup fina...	155
3	ham	U dun say so early hor... U c already then say...	49
4	ham	Nah I don't think he goes to usf, he lives aro...	61

In [8]:

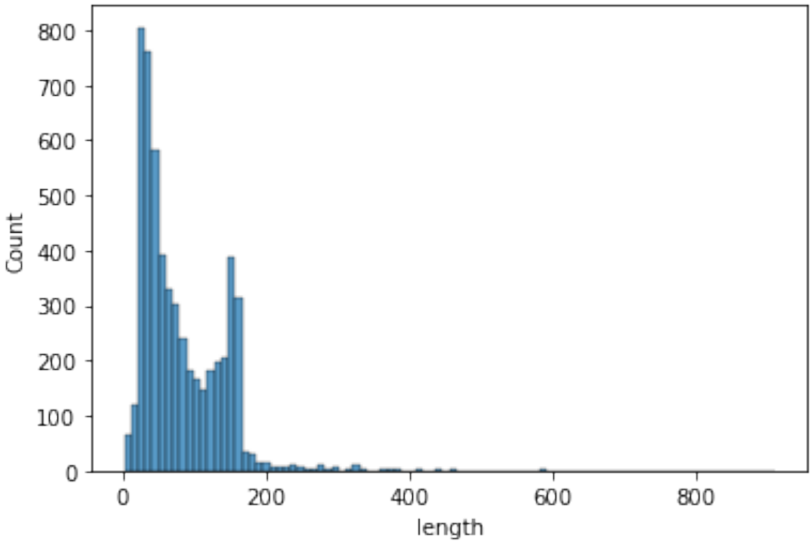
```
df.length.describe()
```

Out[8]:

```
count    5572.00000
mean       80.47649
std        59.93356
min         2.00000
25%        36.00000
50%        62.00000
75%       122.00000
max       910.00000
Name: length, dtype: float64
```

In [9]:
```
sns.histplot(data=df,x='length')
```

Out[9]:
```
<AxesSubplot:xlabel='length', ylabel='Count'>
```



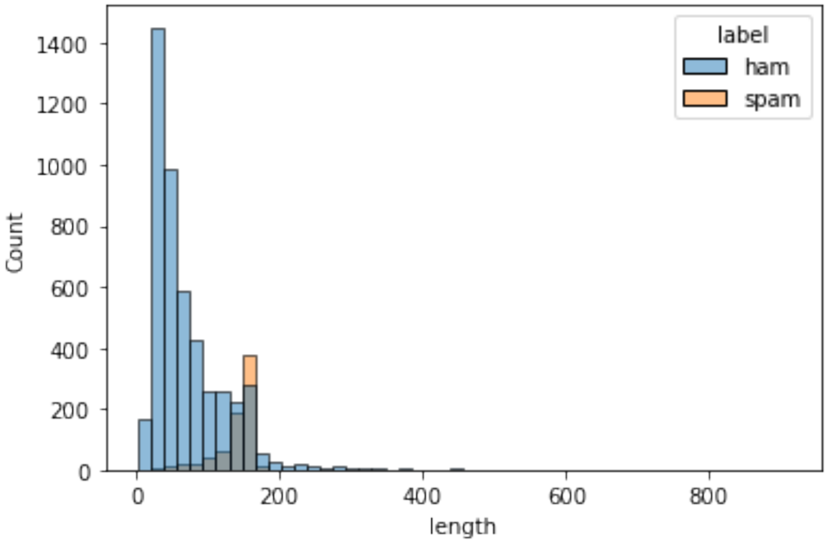
In [10]:
```
df.groupby('label').describe()
```

Out[10]:

	length							
	count	**mean**	**std**	**min**	**25%**	**50%**	**75%**	**max**
label								
ham	4825.0	71.473368	58.435881	2.0	33.0	52.0	93.0	910.0
spam	747.0	138.629183	28.856451	13.0	133.0	149.0	157.0	223.0

In [11]:
```
sns.histplot(data=df, x='length', hue='label', bins=50)
```

Out[11]:
```
<AxesSubplot:xlabel='length', ylabel='Count'>
```



In [12]:
```
m4 = df['message'][3]
print(m4)
```

```
U dun say so early hor... U c already then say...
```

In [13]:
```
import string
```

In [14]:
```
from nltk.corpus import stopwords
stopwords.words('english')[0:10]
```

Out[14]:
```
['i', 'me', 'my', 'myself', 'we', 'our', 'ours', 'ourselves', 'you
', "you're"]
```

In [15]:
```
from sklearn.feature_extraction.text import CountVectorizer
```

In [16]:
```
def text_process(mess):
    nopunc = [char for char in mess if char not in string.punctuati
    nopunc = ''.join(nopunc)
    return [word for word in nopunc.split() if word.lower() not in
```

In [17]:
```
bowt = CountVectorizer(analyzer=text_process).fit(df['message'])
print(len(bowt.vocabulary_))
```

```
11425
```

In [18]:
```
bow4 = bowt.transform([m4])
print(bow4)
print(bow4.shape)
```

```
  (0, 4068)	2
  (0, 4629)	1
  (0, 5261)	1
  (0, 6204)	1
  (0, 6222)	1
  (0, 7186)	1
  (0, 9554)	2
(1, 11425)
```

In [19]:
```
bowtransform = CountVectorizer(analyzer=text_process).fit(df['messa
print(len(bowt.vocabulary_))
```

```
11425
```

In [20]:
```
mbow=bowtransform.transform(df['message'])
```

In [21]:
```
print('Shape of Sparse Matrix: ', mbow.shape)
print('Amount of Non-Zero occurences: ', mbow.nnz)
```

```
Shape of Sparse Matrix:  (5572, 11425)
Amount of Non-Zero occurences:  50548
```

In [22]:
```
from sklearn.feature_extraction.text import TfidfTransformer
```

In [23]:
```
tfidft = TfidfTransformer().fit(mbow)
tfidf4 = tfidft.transform(bow4)
print(tfidf4)
```

```
  (0, 9554)	0.5385626262927564
  (0, 7186)	0.4389365653379857
  (0, 6222)	0.3187216892949149
  (0, 6204)	0.29953799723697416
  (0, 5261)	0.29729957405868723
  (0, 4629)	0.26619801906087187
  (0, 4068)	0.40832589933384067
```

In [24]:
```
mtfidf = tfidft.transform(mbow)
print(mtfidf.shape)
```

```
(5572, 11425)
```

In [25]:
```
from sklearn.naive_bayes import MultinomialNB
det = MultinomialNB().fit(mtfidf, df['label'])
```

In [26]:
```
print('predicted:', det.predict(tfidf4)[0])
print('expected:', df.label[3])
```

```
predicted: ham
expected: ham
```

In [27]:
```
pred = det.predict(mtfidf)
print(pred)
```

```
['ham' 'ham' 'spam' ... 'ham' 'ham' 'ham']
```

In [28]:
```
from sklearn.metrics import classification_report
print (classification_report(df['label'], pred))
```

```
              precision    recall  f1-score   support

         ham       0.98      1.00      0.99      4825
        spam       1.00      0.85      0.92       747

    accuracy                           0.98      5572
   macro avg       0.99      0.92      0.95      5572
weighted avg       0.98      0.98      0.98      5572
```

In [29]:
```
from sklearn.model_selection import train_test_split
```

In [30]:
```
msg_train, msg_test, label_train, label_test = \
train_test_split(df['message'], df['label'], test_size=0.2)
```

In [31]:
```
print(len(msg_train), len(msg_test), len(msg_train) + len(msg_test)
```

```
4457 1115 5572
```

In [32]:
```
from sklearn.pipeline import Pipeline
```

In [33]:
```
pipeline = Pipeline([
    ('bow', CountVectorizer(analyzer=text_process)),
    ('tfidf', TfidfTransformer()),
    ('classifier', MultinomialNB()),
])
```

In [34]:
```
pipeline.fit(msg_train,label_train)
```

Out[34]:
```
Pipeline(steps=[('bow',
                 CountVectorizer(analyzer=<function text_process a
t 0x1642b7790>)),
                ('tfidf', TfidfTransformer()),
                ('classifier', MultinomialNB())])
```

In [35]:
```
pred = pipeline.predict(msg_test)
```

```
In [36]: print(classification_report(pred,label_test))
```

```
              precision    recall  f1-score   support

         ham       1.00      0.97      0.98       997
        spam       0.79      1.00      0.88       118

    accuracy                           0.97      1115
   macro avg       0.89      0.98      0.93      1115
weighted avg       0.98      0.97      0.97      1115
```

CHECKING FINAL OUTPUT WITH THE CLASSIFIER

```
In [46]: t=["hello this is input string"]
```

```
In [47]: prediction=pipeline.predict(t)
```

```
In [50]: print(classification_report(prediction,t))
```

```
                            precision    recall  f1-score   suppor
t

                       ham       0.00      0.00      0.00       1.
0
hello this is input string       0.00      0.00      0.00       0.
0

                  accuracy                           0.00       1.
0
                 macro avg       0.00      0.00      0.00       1.
0
              weighted avg       0.00      0.00      0.00       1.
0


/Users/zeelmehta/opt/anaconda3/lib/python3.9/site-packages/sklearn
/metrics/_classification.py:1318: UndefinedMetricWarning: Precisio
n and F-score are ill-defined and being set to 0.0 in labels with
no predicted samples. Use `zero_division` parameter to control thi
s behavior.
  _warn_prf(average, modifier, msg_start, len(result))
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true samples. Use `zero_division` parameter to control this behavi
or.
  _warn_prf(average, modifier, msg_start, len(result))
```

```
In [ ]:
```