```
# utilities
import re
import numpy as np
import pandas as pd
# plotting
import seaborn as sns
from wordcloud import WordCloud
import matplotlib.pyplot as plt
# nltk
from nltk.stem import WordNetLemmatizer
# sklearn
from sklearn.svm import LinearSVC
from sklearn.naive_bayes import BernoulliNB
from sklearn.linear_model import LogisticRegression
from sklearn.model_selection import train_test_split
from sklearn.feature_extraction.text import TfidfVectorizer
from sklearn.metrics import confusion_matrix, classification_report
```

```
# Importing the dataset
DATASET_COLUMNS=['target','ids','date','flag','user','text']
DATASET_ENCODING = "ISO-8859-1"
```

```
df = pd.read_csv(r'd:\\talent_battle\\training.1600000.processed.noemoticon.csv'
, encoding=DATASET_ENCODING, names=DATASET_COLUMNS)
```

```
df.sample(5)
```

	target	ids	date	flag	user	text
1283375	4	2001935255	Tue Jun 02 02:35:01 PDT 2009	NO_QUERY	keesitt	@munz its better u load finish b4 u watch u w...
738404	0	2265466410	Sun Jun 21 06:38:43 PDT 2009	NO_QUERY	INnoSynCE	Good morning ya'll! Happy Father's Day!! So ti...
1172263	4	1980604816	Sun May 31 07:11:54	NO_QUERY	Rae4OSU	@natneagle check your email

```
df.head()
```

	target	ids	date	flag	user	text
0	0	1467810369	Mon Apr 06 22:19:45 PDT 2009	NO_QUERY	_TheSpecialOne_	@switchfoot http://twitpic.com/2y1zl - Awww, t...
1	0	1467810672	Mon Apr 06 22:19:49 PDT 2009	NO_QUERY	scotthamilton	is upset that he can't update his Facebook by ...

```
df.columns
```

```
Index(['target', 'ids', 'date', 'flag', 'user', 'text'], dtype='object')
```

```
print('length of data is', len(df))
```

```
length of data is 1600000
```

```
df. shape
```

```
(1600000, 6)
```

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1600000 entries, 0 to 1599999
Data columns (total 6 columns):
 #   Column  Non-Null Count    Dtype 
---  ------  --------------    ----- 
 0   target  1600000 non-null  int64 
 1   ids     1600000 non-null  int64 
 2   date    1600000 non-null  object
 3   flag    1600000 non-null  object
 4   user    1600000 non-null  object
 5   text    1600000 non-null  object
dtypes: int64(2), object(4)
memory usage: 73.2+ MB
```

```
df.dtypes
```

```
target     int64
ids        int64
date      object
flag      object
user      object
text      object
dtype: object
```

```
data=df[['text','target']]
```

```
data['target'].unique()
```

```
array([0, 4], dtype=int64)
```

```
print('Count of columns in the data is:  ', len(df.columns))
print('Count of rows in the data is:  ', len(df))
```

```
Count of columns in the data is:   6
Count of rows in the data is:   1600000
```

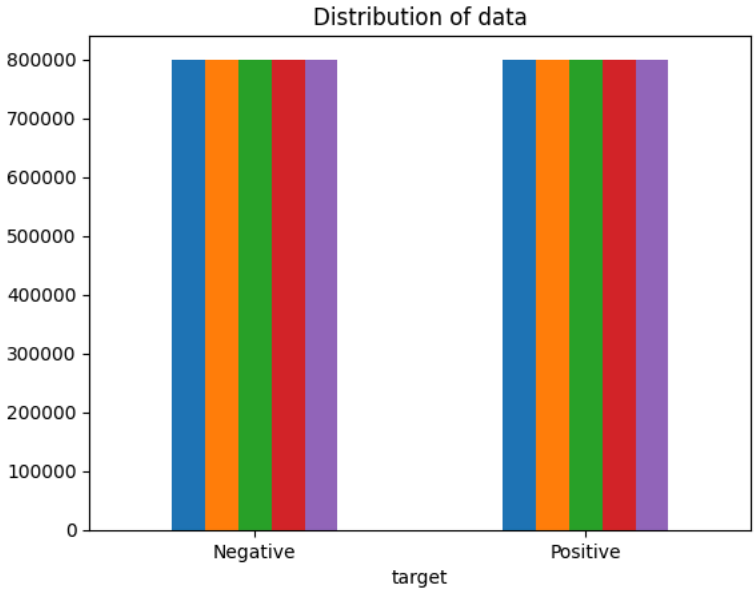
```
np.sum(df.isnull().any(axis=1))
```

```
0
```

```
df['target'].nunique()
```

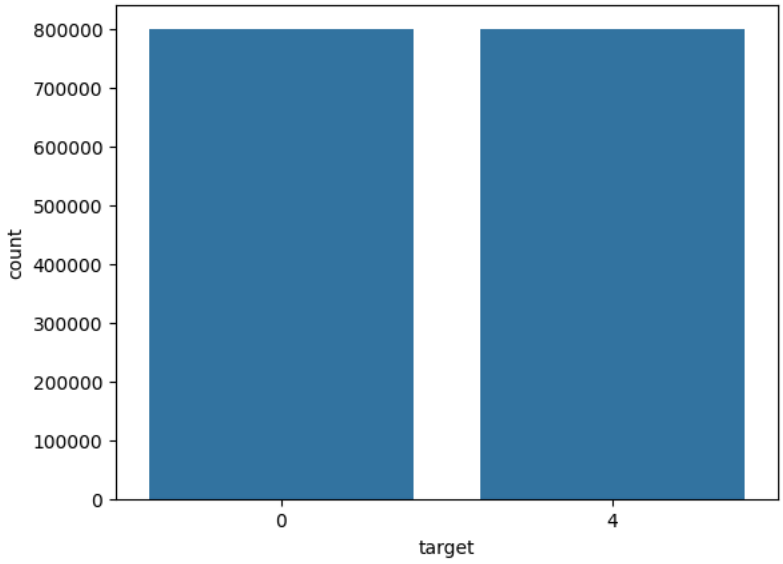
```
2
```

```
# Plotting the distribution for dataset.
ax = df.groupby('target').count().plot(kind='bar', title='Distribution of data',legend=False)
ax.set_xticklabels(['Negative','Positive'], rotation=0)
# Storing data in lists.
text, sentiment = list(df['text']), list(df['target'])
```




```
import seaborn as sns
sns.countplot(x='target', data=df)
```

```
<Axes: xlabel='target', ylabel='count'>
```




```
Start coding or generate with AI.
```

```
Start coding or generate with AI.
```

```
Start coding or generate with AI.
```

```
data_pos = data[data['target'] == 4]
data_neg = data[data['target'] == 0]
```

```
data_pos = data_pos.iloc[:int(2000)]
data_neg = data_neg.iloc[:int(2000)]
```

```
dataset = pd.concat([data_pos, data_neg])
```

```
dataset['text']=dataset['text'].str.lower()
```

```
dataset['text'].tail()
```

```
1995                           @roxy_yeah yep a loser.
1996    and finito! all bathroom contractors been thru...
1997    @caitlinaudrey awww!  that sucks! are you goin...
1998    sorry, sf. rescheduling my sf trip for this co...
1999    2morw  i get my blasted wisdom teeth pulled! n...
Name: text, dtype: object
```

```
stopwordlist = ['a', 'about', 'above', 'after', 'again', 'ain', 'all', 'am', 'an',
             'and','any','are', 'as', 'at', 'be', 'because', 'been', 'before',
             'being', 'below', 'between','both', 'by', 'can', 'd', 'did', 'do',
             'does', 'doing', 'down', 'during', 'each','few', 'for', 'from',
             'further', 'had', 'has', 'have', 'having', 'he', 'her', 'here',
             'hers', 'herself', 'him', 'himself', 'his', 'how', 'i', 'if', 'in',
             'into','is', 'it', 'its', 'itself', 'just', 'll', 'm', 'ma',
             'me', 'more', 'most','my', 'myself', 'now', 'o', 'of', 'on', 'once',
             'only', 'or', 'other', 'our', 'ours','ourselves', 'out', 'own', 're','s', 'same', 'she', "shes", 'should', "shouldve",'so',
             't', 'than', 'that', "thatll", 'the', 'their', 'theirs', 'them',
             'themselves', 'then', 'there', 'these', 'they', 'this', 'those',
             'through', 'to', 'too','under', 'until', 'up', 've', 'very', 'was',
             'we', 'were', 'what', 'when', 'where','which','while', 'who', 'whom',
             'why', 'will', 'with', 'won', 'y', 'you', "youd","youll", "youre",
             "youve", 'your', 'yours', 'yourself', 'yourselves']
```

```
STOPWORDS = set(stopwordlist)
def cleaning_stopwords(text):
    return " ".join([word for word in str(text).split() if word not in STOPWORDS])
dataset['text'] = dataset['text'].apply(lambda text: cleaning_stopwords(text))
dataset['text'].tail()
```

```
1995                               @roxy_yeah yep loser.
1996    finito! bathroom contractors thru house. quote...
1997        @caitlinaudrey awww! sucks! going sydney one?
1998    sorry, sf. rescheduling sf trip coming weekend...
1999    2morw get blasted wisdom teeth pulled! need sl...
Name: text, dtype: object
```

```
import string
english_punctuations = string.punctuation
punctuations_list = english_punctuations
def cleaning_punctuations(text):
    translator = str.maketrans('', '', punctuations_list)
    return text.translate(translator)
dataset['text']= dataset['text'].apply(lambda x: cleaning_punctuations(x))
dataset['text'].tail()
```

```
1995                                  roxyyeah yep loser
1996    finito bathroom contractors thru house quotes ...
1997            caitlinaudrey awww sucks going sydney one
1998    sorry sf rescheduling sf trip coming weekend m...
1999    2morw get blasted wisdom teeth pulled need sle...
Name: text, dtype: object
```

```
def cleaning_repeating_char(text):
    return re.sub(r'(.)1+', r'1', text)
dataset['text'] = dataset['text'].apply(lambda x: cleaning_repeating_char(x))
dataset['text'].tail()
```

```
1995                                 roxyyeah yep loser
1996    finito bathroom contractors thru house quotes ...
1997            caitlinaudrey awww sucks going sydney one
1998    sorry sf rescheduling sf trip coming weekend m...
1999    2morw get blasted wisdom teeth pulled need sle...
Name: text, dtype: object
```

```
def cleaning_URLs(data):
    return re.sub('((www.[^s]+)|(https?://[^s]+))',' ',data)
dataset['text'] = dataset['text'].apply(lambda x: cleaning_URLs(x))
dataset['text'].tail()
```

```
1995                                 roxyyeah yep loser
1996    finito bathroom contractors thru house quotes ...
1997            caitlinaudrey awww sucks going sydney one
1998    sorry sf rescheduling sf trip coming weekend m...
1999    2morw get blasted wisdom teeth pulled need sle...
Name: text, dtype: object
```

```
def cleaning_numbers(data):
    return re.sub('[0-9]+', '', data)
dataset['text'] = dataset['text'].apply(lambda x: cleaning_numbers(x))
dataset['text'].tail()
```

```
1995                                 roxyyeah yep loser
1996    finito bathroom contractors thru house quotes ...
1997            caitlinaudrey awww sucks going sydney one
1998    sorry sf rescheduling sf trip coming weekend m...
1999    morw get blasted wisdom teeth pulled need slee...
Name: text, dtype: object
```

```
from nltk.tokenize import RegexpTokenizer
tokenizer = RegexpTokenizer(r'w+')
dataset['text'] = dataset['text'].apply(tokenizer.tokenize)
dataset['text'].head()
```

```
800000          []
800001         [w]
800002    [w, w, w]
800003          []
800004          []
Name: text, dtype: object
```

```
import nltk
st = nltk.PorterStemmer()
def stemming_on_text(data):
    text = [st.stem(word) for word in data]
    return data
dataset['text']= dataset['text'].apply(lambda x: stemming_on_text(x))
dataset['text'].tail()
```

```
1995          []
1996          []
1997       [www]
1998         [w]
1999    [w, w, w]
Name: text, dtype: object
```

```
lm = nltk.WordNetLemmatizer()
def lemmatizer_on_text(data):
    text = [lm.lemmatize(word) for word in data]
    return data
dataset['text'] = dataset['text'].apply(lambda x: lemmatizer_on_text(x))
dataset['text'].head()
```

```
800000           []
800001          [w]
800002    [w, w, w]
800003           []
800004           []
Name: text, dtype: object
```

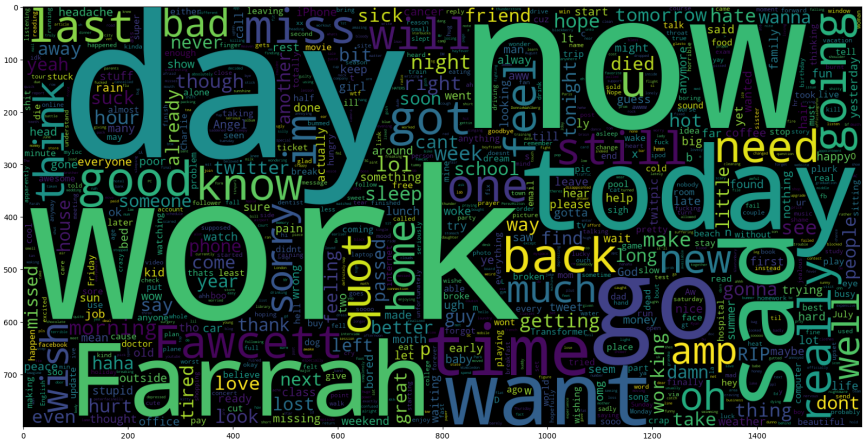
```
X=data.text[790000:810000]
y=data.target[790000:810000]

print(len(X),len(y))
```

```
20000 20000
```

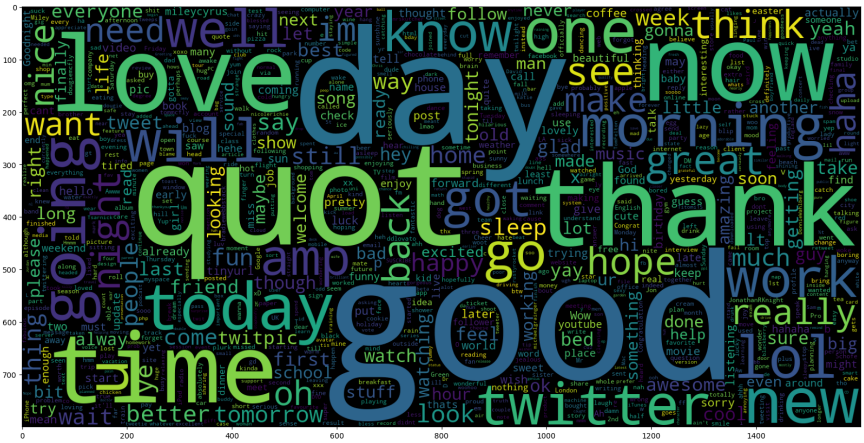
```
data_neg = data['text'][790000:800000]
plt.figure(figsize = (20,20))
wc = WordCloud(max_words = 1000 , width = 1600 , height = 800,
               collocations=False).generate(" ".join(data_neg))
plt.imshow(wc)
```

```
<matplotlib.image.AxesImage at 0x2490623a310>
```




```
data_pos = data['text'][800000:810000]
wc = WordCloud(max_words = 1000 , width = 1600 , height = 800,
               collocations=False).generate(" ".join(data_pos))
plt.figure(figsize = (20,20))
plt.imshow(wc)
```

```
<matplotlib.image.AxesImage at 0x249b77f9090>
```




```
from sklearn.model_selection import train_test_split

X_train, X_test, y_train, y_test = train_test_split(X,y,test_size = 0.05, random_state =26105111)
```

```
from sklearn.feature_extraction.text import TfidfVectorizer
from sklearn.model_selection import train_test_split
from sklearn.naive_bayes import BernoulliNB

# Assuming X_train_text and X_test_text contain the text data
# Splitting the data into training and testing sets
X_train_text, X_test_text, y_train, y_test = train_test_split(X, y, test_size=0.05, random_state=26105111)

# Create TF-IDF vectorizer
vectorizer = TfidfVectorizer()

# Fit and transform the training text data
X_train = vectorizer.fit_transform(X_train_text)

# Transform the testing text data
X_test = vectorizer.transform(X_test_text)

# Create and fit the BernoulliNB model
BNBmodel = BernoulliNB()
BNBmodel.fit(X_train, y_train)

# Now you can use the trained model for prediction
y_pred = BNBmodel.predict(X_test)
```

```
def model_Evaluate(model):
    # Predict values for Test dataset
    y_pred = model.predict(X_test)

    # Print the evaluation metrics for the dataset.
    print(classification_report(y_test, y_pred))

    # Compute and plot the Confusion matrix
    cf_matrix = confusion_matrix(y_test, y_pred)
    categories = ['Negative','Positive']
    group_names = ['True Neg','False Pos', 'False Neg','True Pos']
    group_percentages = ['{0:.2%}'.format(value) for value in cf_matrix.flatten() / np.sum(cf_matrix)]
    labels = [f'{v1}n{v2}' for v1, v2 in zip(group_names, group_percentages)]

    # Reshape labels array to 2x2 array
    labels = np.asarray(labels).reshape(2, 2)

    sns.heatmap(cf_matrix, annot=labels, cmap='Blues', fmt='',
                xticklabels=categories, yticklabels=categories)
    plt.xlabel("Predicted values", fontdict={'size':14}, labelpad=10)
    plt.ylabel("Actual values", fontdict={'size':14}, labelpad=10)
    plt.title("Confusion Matrix", fontdict={'size':18}, pad=20)
```

```
BNBmodel = BernoulliNB()
BNBmodel.fit(X_train, y_train)
```

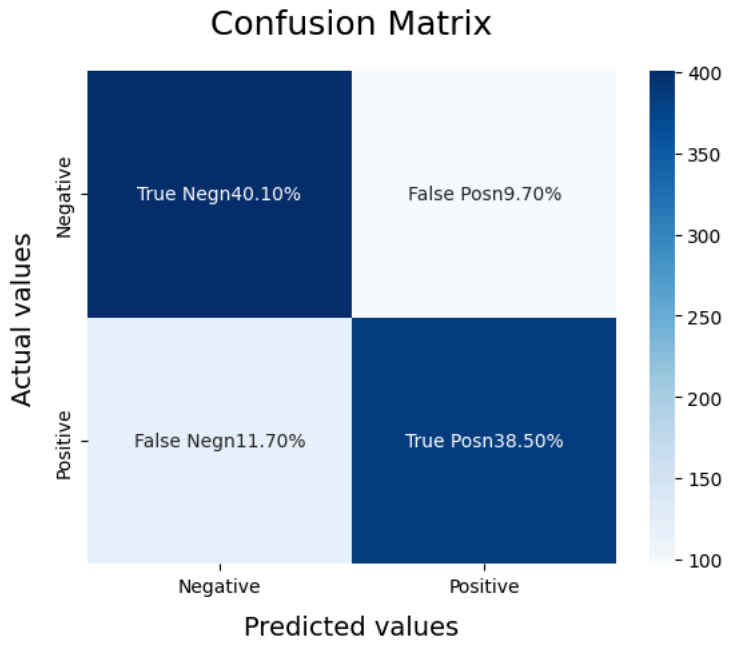
```
BernoulliNB
BernoulliNB()
```

```
model_Evaluate(BNBmodel)
y_pred = BNBmodel.predict(X_test)
```

```
              precision    recall  f1-score   support

           0       0.77      0.81      0.79       498
           4       0.80      0.77      0.78       502

    accuracy                           0.79      1000
   macro avg       0.79      0.79      0.79      1000
weighted avg       0.79      0.79      0.79      1000
```



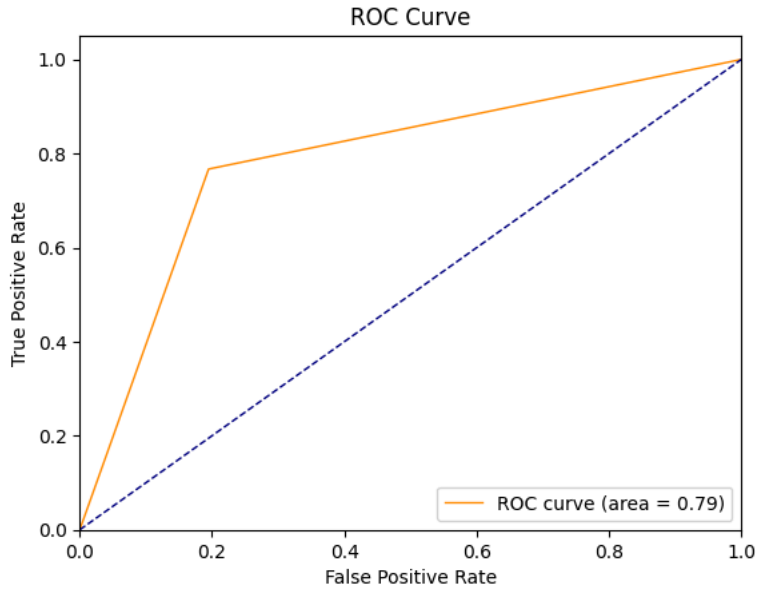
```
import numpy as np
import matplotlib.pyplot as plt
from sklearn.metrics import roc_curve, auc

# Map label 4 to 1 and keep label 0 as is
y_test_binary = np.where(y_test == 4, 1, y_test)

# Calculate ROC curve
fpr, tpr, thresholds = roc_curve(y_test_binary, y_pred)

# Calculate AUC score
roc_auc = auc(fpr, tpr)

# Plot ROC curve
plt.figure()
plt.plot(fpr, tpr, color='darkorange', lw=1, label='ROC curve (area = %0.2f)' % roc_auc)
plt.plot([0, 1], [0, 1], color='navy', lw=1, linestyle='--')
plt.xlim([0.0, 1.0])
plt.ylim([0.0, 1.05])
plt.xlabel('False Positive Rate')
plt.ylabel('True Positive Rate')
plt.title('ROC Curve')
plt.legend(loc="lower right")
plt.show()
```



SVC MODEL

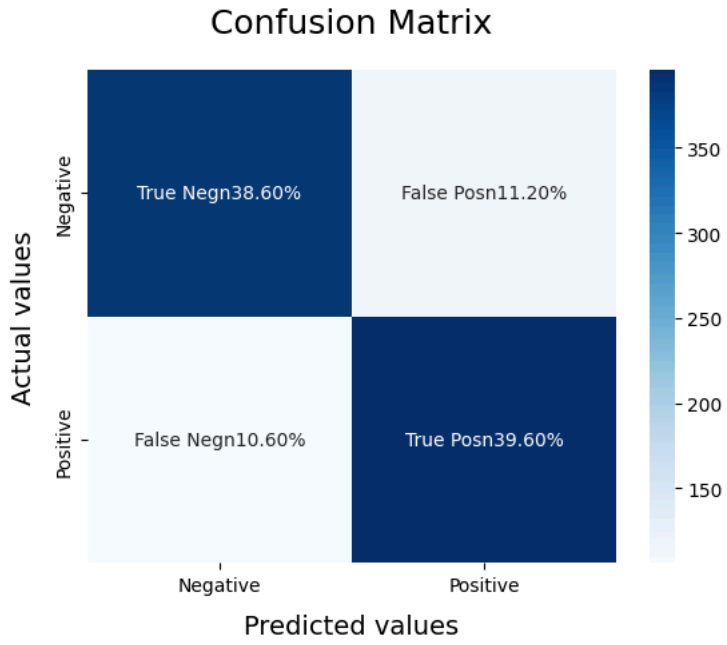
```
SVCmodel = LinearSVC()
SVCmodel.fit(X_train, y_train)
```

```
C:\Users\DELL\AppData\Local\Packages\PythonSoftwareFoundation.Python.3.11_qbz5n2kfra8
  warnings.warn(
```

```
LinearSVC()
```

```
model_Evaluate(SVCmodel)
y_pred2 = SVCmodel.predict(X_test)
```

	precision	recall	f1-score	support
0	0.78	0.78	0.78	498
4	0.78	0.79	0.78	502
accuracy			0.78	1000
macro avg	0.78	0.78	0.78	1000
weighted avg	0.78	0.78	0.78	1000



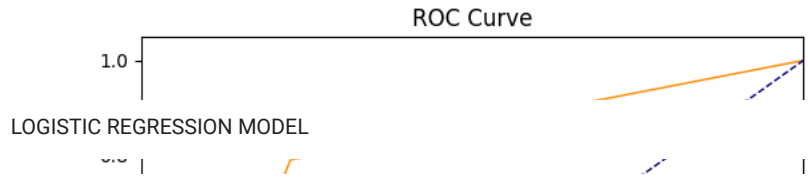

```
import numpy as np
import matplotlib.pyplot as plt
from sklearn.metrics import roc_curve, auc

# Map label 4 to 1 and keep label 0 as is
y_test_binary = np.where(y_test == 4, 1, y_test)

# Calculate ROC curve for y_pred2
fpr, tpr, thresholds = roc_curve(y_test_binary, y_pred2)

# Calculate AUC score
roc_auc = auc(fpr, tpr)

# Plot ROC curve
plt.figure()
plt.plot(fpr, tpr, color='darkorange', lw=1, label='ROC curve (area = %0.2f)' % roc_auc)
plt.plot([0, 1], [0, 1], color='navy', lw=1, linestyle='--')
plt.xlim([0.0, 1.0])
plt.ylim([0.0, 1.05])
plt.xlabel('False Positive Rate')
plt.ylabel('True Positive Rate')
plt.title('ROC Curve')
plt.legend(loc="lower right")
plt.show()
```



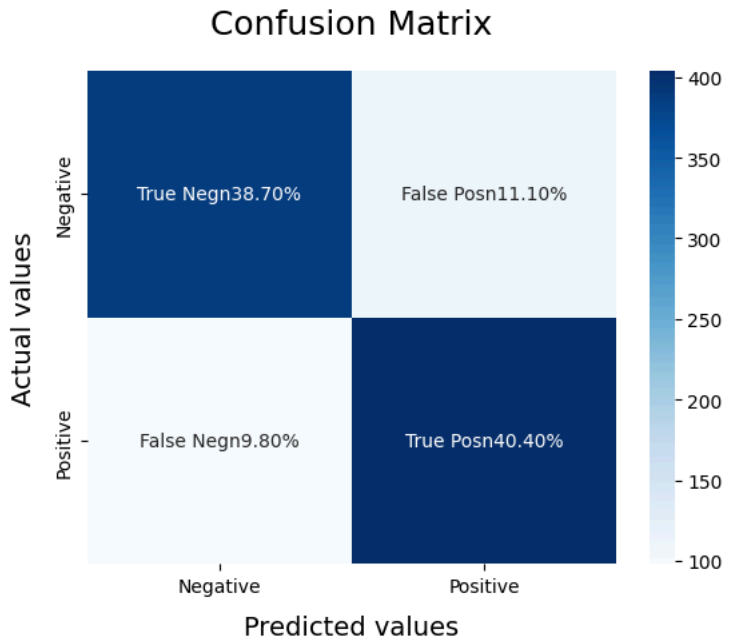
LOGISTIC REGRESSION MODEL

```
LRmodel = LogisticRegression(C = 2, max_iter = 1000, n_jobs=-1)
LRmodel.fit(X_train, y_train)
```

```
LogisticRegression
LogisticRegression(C=2, max_iter=1000, n_jobs=-1)
```

```
model_Evaluate(LRmodel)
y_pred3 = LRmodel.predict(X_test)
```

	precision	recall	f1-score	support
0	0.80	0.78	0.79	498
4	0.78	0.80	0.79	502
accuracy			0.79	1000
macro avg	0.79	0.79	0.79	1000
weighted avg	0.79	0.79	0.79	1000




```
import numpy as np
import matplotlib.pyplot as plt
from sklearn.metrics import roc_curve, auc

# Map label 4 to 1 and keep label 0 as is
y_test_binary = np.where(y_test == 4, 1, y_test)

# Calculate ROC curve for y_pred3
fpr, tpr, thresholds = roc_curve(y_test_binary, y_pred3)

# Calculate AUC score
roc_auc = auc(fpr, tpr)

# Plot ROC curve
plt.figure()
plt.plot(fpr, tpr, color='darkorange', lw=1, label='ROC curve (area = %0.2f)' % roc_auc)
plt.plot([0, 1], [0, 1], color='navy', lw=1, linestyle='--')
plt.xlim([0.0, 1.0])
```