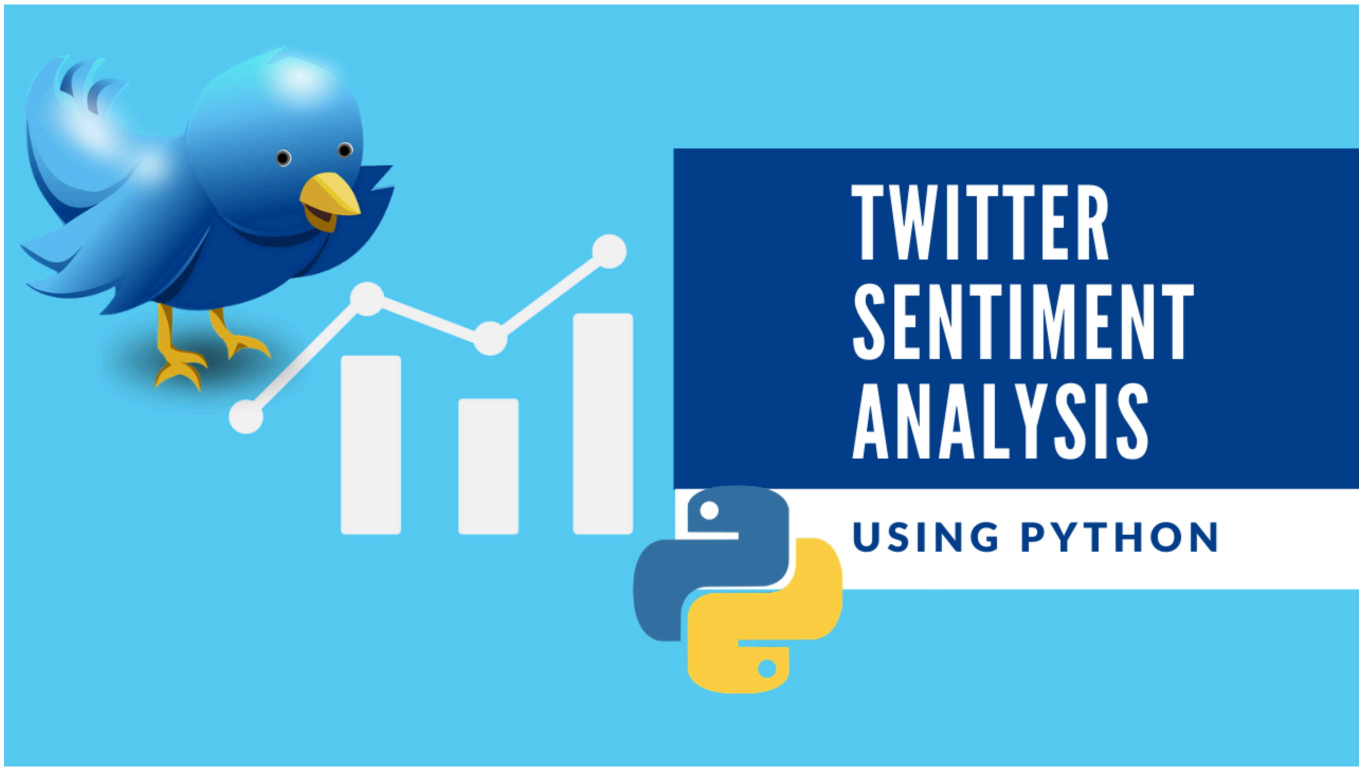
Twitter Sentiment Analysis



Importing libraries

```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
from nltk.corpus import stopwords
from wordcloud import WordCloud
from nltk.stem.porter import PorterStemmer
from sklearn.feature_extraction.text import TfidfVectorizer
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LogisticRegression
from sklearn.naive_bayes import MultinomialNB
from sklearn.metrics import accuracy_score, precision_score, recall_score, f1_score
from sklearn.metrics import confusion_matrix, classification_report
import re
```

Loading Dataset

```
columns_names = ['target', 'id', 'date', 'flag', 'user', 'text']

twitter_data=pd.read_csv('/kaggle/input/sentiment140/training.1600000.processed.noemoticon.csv',names=columns_names, encoding = 'ISO-8859-1'
twitter_data
```

	target	id	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 ...
2	0	1467810917	Mon Apr 06 22:19:53 PDT 2009	NO_QUERY	mattycus	@Kenichan I dived many times for the ball. Man...
3	0	1467811184	Mon Apr 06 22:19:57 PDT 2009	NO_QUERY	ElleCTF	my whole body feels itchy and like its on fire
4	0	1467811193	Mon Apr 06 22:19:57 PDT 2009	NO_QUERY	Karoli	@nationwideclass no, it's not behaving at all....
...	...	...	...	...	...	...
1599995	4	2193601966	Tue Jun 16 08:40:49 PDT 2009	NO_QUERY	AmandaMarie1028	Just woke up. Having no school is the best fee...
1599996	4	2193601969	Tue Jun 16 08:40:49 PDT 2009	NO_QUERY	TheWDBoards	TheWDB.com - Very cool to hear old Walt interv...
1599997	4	2193601991	Tue Jun 16 08:40:49 PDT 2009	NO_QUERY	bpbabe	Are you ready for your MoJo Makeover? Ask me f...
1599998	4	2193602064	Tue Jun 16 08:40:49 PDT 2009	NO_QUERY	tinydiamondz	Happy 38th Birthday to my boo of alll time!!! ...
1599999	4	2193602129	Tue Jun 16 08:40:50 PDT 2009	NO_QUERY	RyanTrevMorris	happy #charitytuesday @theNSPCC @SparksCharity...

1600000 rows x 6 columns

Exploring and Pre-Processing

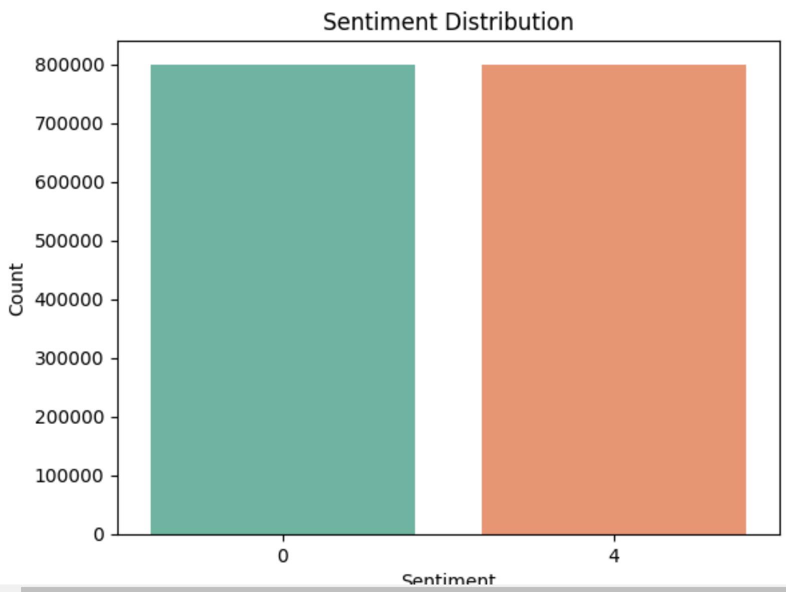
Exploratory Data Analysis

```
print(twitter_data.head())
print("\n\n")
print(twitter_data.describe())
print("\n\n")
print(twitter_data.info())
print("\n\n")
print(twitter_data.shape)
```

```
   target          id                          date      flag  \
0       0  1467810369  Mon Apr 06 22:19:45 PDT 2009  NO_QUERY
1       0  1467810672  Mon Apr 06 22:19:49 PDT 2009  NO_QUERY
2       0  1467810917  Mon Apr 06 22:19:53 PDT 2009  NO_QUERY
3       0  1467811184  Mon Apr 06 22:19:57 PDT 2009  NO_QUERY
4       0  1467811193  Mon Apr 06 22:19:57 PDT 2009  NO_QUERY

              user                                               text
0  _TheSpecialOne_  @switchfoot http://twitpic.com/2y1zl - Awww, t...
1    scotthamilton  is upset that he can't update his Facebook by ...
2         mattycus  @Kenichan I dived many times for the ball. Man...
3          ElleCTF    my whole body feels itchy and like its on fire
4           Karoli  @nationwideclass no, it's not behaving at all....



             target            id
count  1.600000e+06  1.600000e+06
mean   2.000000e+00  1.998818e+09
std    2.000001e+00  1.935761e+08
min    0.000000e+00  1.467810e+09
25%    0.000000e+00  1.956916e+09
50%    2.000000e+00  2.002102e+09
75%    4.000000e+00  2.177059e+09
max    4.000000e+00  2.329206e+09



<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   id      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
None



(1600000, 6)
```

```
sns.countplot(x='target', data=twitter_data, palette='Set2')
plt.title('Sentiment Distribution')
plt.xlabel('Sentiment')
plt.ylabel('Count')
plt.show()
```



Data Cleaning

```
print(twitter_data.isnull().sum())
print("\n\n")
print(twitter_data.duplicated().sum())
print("\n\n")
twitter_data = twitter_data.drop_duplicates()
```

```
target    0
id        0
date      0
flag      0
user      0
text      0
dtype: int64



0
```

```
print(twitter_data['target'].value_counts())
print("\n\n")
twitter_data.replace({'target': {4: 1}}, inplace=True)
print("\n\n")
print(twitter_data['target'].value_counts())
```

```
target
0    800000
4    800000
Name: count, dtype: int64
```

```
target
0    800000
1    800000
Name: count, dtype: int64
```

Importing Stop Words

```
import nltk
nltk.download('stopwords')
```

```
[nltk_data] Error loading stopwords: <urlopen error [Errno -3]
[nltk_data]     Temporary failure in name resolution>
False
```

```
print(stopwords.words('english'))
```

```
['i', 'me', 'my', 'myself', 'we', 'our', 'ours', 'ourselves', 'you', "you're", "you've", "you'll", "you'd", 'your', 'yours', 'yourself',
```

Using PorterStemmer for Word Stemming

```
port_stem = PorterStemmer()
```

Stemming

```
def stemming(content):

    stemmed_content = re.sub('[^a-zA-Z]',' ', content)
    stemmed_content = stemmed_content.lower()
    stemmed_content = stemmed_content.split()
    stemmed_content = [port_stem.stem(word) for word in stemmed_content if not word in stopwords.words('english')]
    stemmed_content = ' '.join(stemmed_content)

    return stemmed_content
```

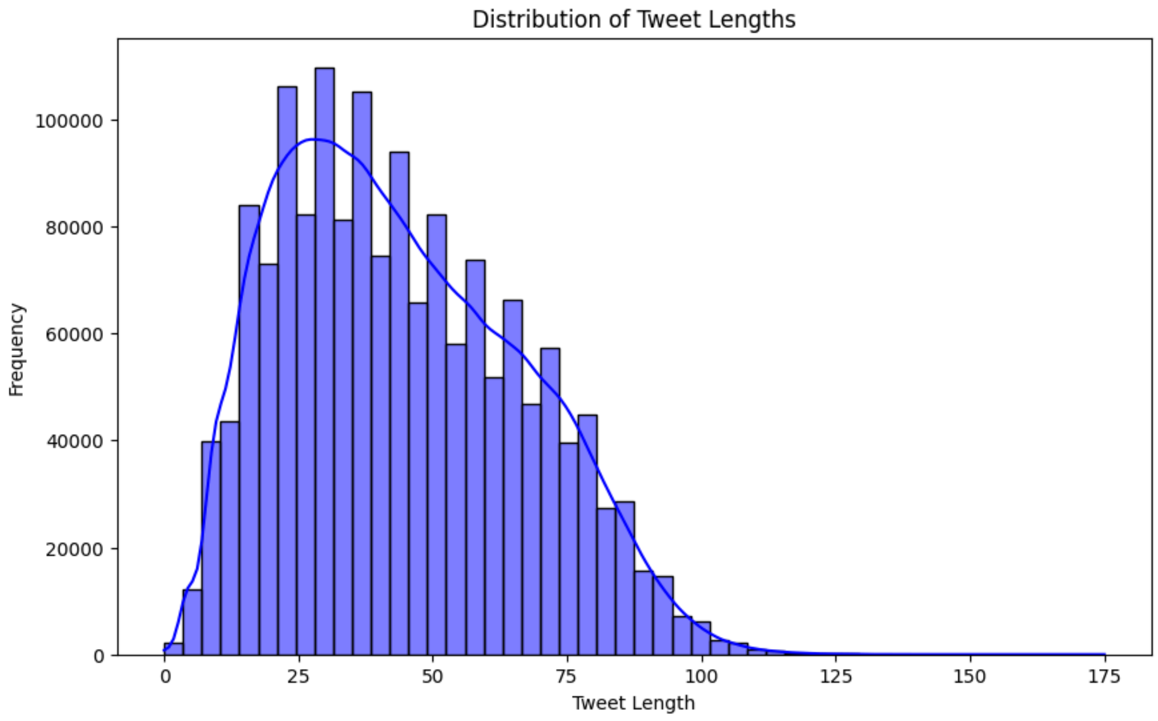
```
twitter_data['stemmed_content'] = twitter_data['text'].apply(stemming)
```

Analyzing Tweet Lengths

```
twitter_data['text_length'] = twitter_data['stemmed_content'].apply(len)
```

```
plt.figure(figsize=(10, 6))
sns.histplot(twitter_data['text_length'], bins=50, kde=True, color='blue')
plt.title('Distribution of Tweet Lengths')
plt.xlabel('Tweet Length')
plt.ylabel('Frequency')
plt.show()
```

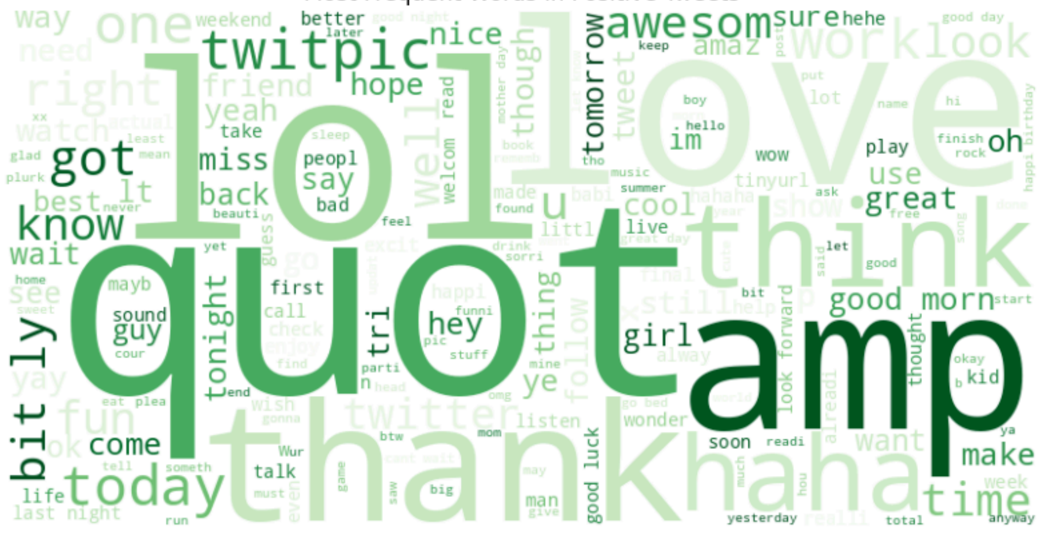
```
/opt/conda/lib/python3.10/site-packages/seaborn/_oldcore.py:1119: FutureWarning: use_inf_as_na option is deprecated and will be removed
  with pd.option_context('mode.use_inf_as_na', True):
```



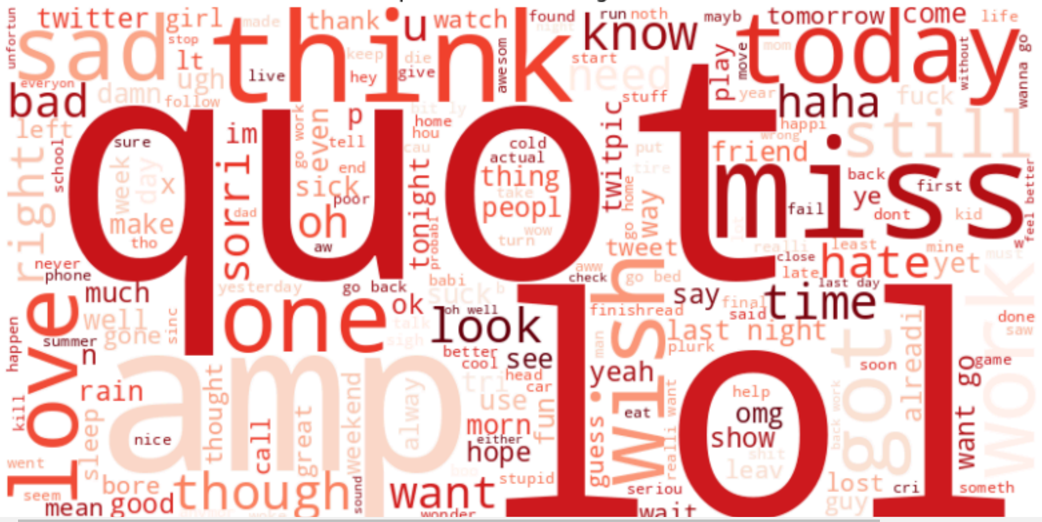
Generating Word Clouds for Positive and Negative Tweets

```
positive_tweets = twitter_data[twitter_data['target'] == 1]
negative_tweets = twitter_data[twitter_data['target'] == 0]

positive_words = ' '.join(positive_tweets['stemmed_content'])
negative_words = ' '.join(negative_tweets['stemmed_content'])

wordcloud_pos = WordCloud(width=800, height=400, background_color='white', colormap='Greens').generate(positive_words)
plt.figure(figsize=(10, 6))
plt.imshow(wordcloud_pos, interpolation='bilinear')
plt.axis('off')
plt.title('Most Frequent Words in Positive Tweets')
plt.show()

wordcloud_neg = WordCloud(width=800, height=400, background_color='white', colormap='Reds').generate(negative_words)
plt.figure(figsize=(10, 6))
plt.imshow(wordcloud_neg, interpolation='bilinear')
plt.axis('off')
plt.title('Most Frequent Words in Negative Tweets')
plt.show()
```

Most Frequent Words in Positive Tweets



Most Frequent Words in Negative Tweets



```
twitter_data.head()
```

	target	id	date	flag	user	text	stemmed_content	text_length
0	0	1467810369	Mon Apr 06 22:19:45 PDT 2009	NO_QUERY	_TheSpecialOne_	@switchfoot http://twitpic.com/2y1zl - Awww, t...	switchfoot http twitpic com zl awww bummer sho...	75
1	0	1467810672	Mon Apr 06 22:19:49 PDT 2009	NO_QUERY	scotthamilton	is upset that he can't update his Facebook by ...	upset updat facebook text might cri result sch...	65
2	0	1467810917	Mon Apr 06 22:19:53 PDT 2009	NO_QUERY	mattycus	@Kenichan I dived many times for the ball. Man...	kenichan dive mani time ball manag save rest g...	53
3	0	1467811184	Mon Apr 06	NO_QUERY	ElleCTF	my whole body feels itchy and like		21

Preparing Data for Model Training

```
twitter_data.drop(['text'], axis =1,inplace = True)
```

```
X = twitter_data['stemmed_content'].values
Y = twitter_data['target'].values
```

Splitting Data into Training and Testing Sets

```
X_train, X_test, y_train, y_test = train_test_split(X, Y, test_size = 0.01, stratify = Y, random_state = 42)
```

Vectorizing the Data (TF-IDF)

```
vectorizer = TfidfVectorizer(max_features=5000, ngram_range=(1, 2))
X_train = vectorizer.fit_transform(X_train)
X_test = vectorizer.transform(X_test)
```

Training the Logistic Regression Model

```
model = LogisticRegression(max_iter=10000)
```

```
model.fit(X_train, y_train)
```

```
▾       LogisticRegression
LogisticRegression(max_iter=10000)
```

Evaluating the Model Performance

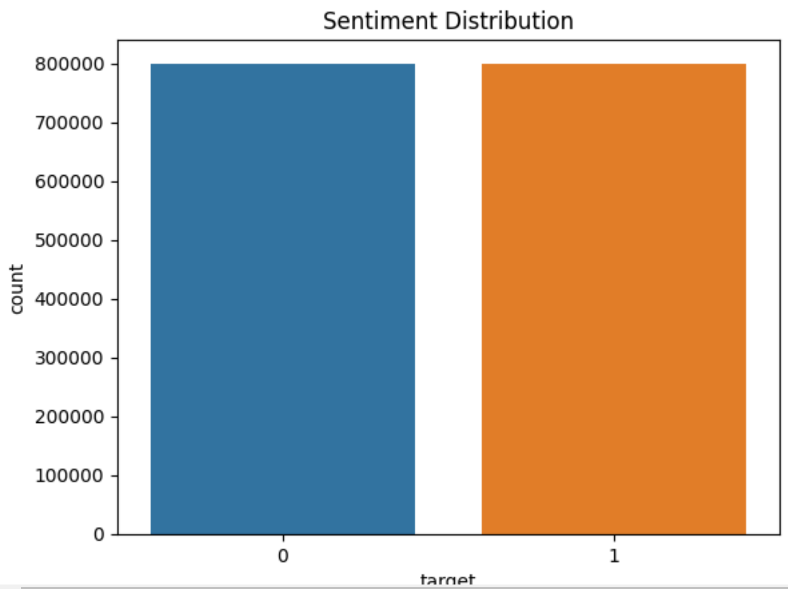
```
y_pred = model.predict(X_test)

print('Accuracy Score', accuracy_score(y_test, y_pred))
print('\nPrecision Score', precision_score(y_test, y_pred))
print('\nRecall Score', recall_score(y_test, y_pred))
print('\nf1 Score', f1_score(y_test, y_pred))
```

```
print('\nClassification Report\n',classification_report(y_test, y_pred))
```

```
Accuracy Score 0.7743125

Precision Score 0.7588769611890999

Recall Score 0.804125

f1 Score 0.7808460277963222

Classification Report
               precision    recall  f1-score   support

           0       0.79      0.74      0.77      8000
           1       0.76      0.80      0.78      8000

    accuracy                           0.77     16000
   macro avg       0.78      0.77      0.77     16000
weighted avg       0.78      0.77      0.77     16000
```

Double-click (or enter) to edit

```
sns.countplot(x='target', data=twitter_data)
plt.title('Sentiment Distribution')
plt.show()

def plot_confusion_matrix(y_true, y_pred, title='Confusion Matrix'):
    cm = confusion_matrix(y_true, y_pred)
    sns.heatmap(cm, annot=True, fmt='d', cmap='Blues')
    plt.xlabel('Predicted')
    plt.ylabel('Actual')
    plt.title(title)
    plt.show()
```



Visualizing Confusion Matrix

```
print('Confusion Matrix', )
print(confusion_matrix(y_test, y_pred))
```

```
Confusion Matrix
[[5956 2044]
 [1567 6433]]
```

Predicting Sentiment on New Text

```
def predict_sentiment(text):
    preprocessed_text = stemming(text)

    text_vector = vectorizer.transform([preprocessed_text])

    prediction = model.predict(text_vector)

    sentiment = 'Positive' if prediction[0] == 1 else 'Negative'

    return sentiment


example_texts = [
    "I love this product! It's amazing.",
    "This is the worst experience I have ever had.",
```