In [1]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
from sklearn.metrics import classification_report,accuracy_score,confusion_matrix
import nltk
import re
from nltk.corpus import words,stopwords
from nltk.tokenize import TweetTokenizer
from nltk.stem import WordNetLemmatizer
```

In [2]:
```
data_train = pd.read_csv('train.csv',encoding='unicode_escape')
```

In [3]:
```
data_train.head(15)
```

Out[3]:

	textID	text	selected_text	sentiment	Time of Tweet	Age of User	Co
0	cb774db0d1	I`d have responded, if I were going	I`d have responded, if I were going	neutral	morning	0-20	Afgha
1	549e992a42	Sooo SAD I will miss you here in San Diego!!!	Sooo SAD	negative	noon	21-30	A
2	088c60f138	my boss is bullying me...	bullying me	negative	night	31-45	
3	9642c003ef	what interview! leave me alone	leave me alone	negative	morning	46-60	A
4	358bd9e861	Sons of ****, why couldn`t they put them on t...	Sons of ****,	negative	noon	60-70	
5	28b57f3990	http://www.dothebouncy.com/smf - some shameles...	http://www.dothebouncy.com/smf - some shameles...	neutral	night	70-100	A Ba
6	6e0c6d75b1	2am feedings for the baby are fun when he is a...	fun	positive	morning	0-20	Arg
7	50e14c0bb8	Soooo high	Soooo high	neutral	noon	21-30	A
8	e050245fbd	Both of you	Both of you	neutral	night	31-45	Au
9	fc2cbefa9d	Journey!? Wow... u just became cooler. hehe....	Wow... u just became cooler.	positive	morning	46-60	
10	2339a9b08b	as much as i love to be hopeful, i reckon the...	as much as i love to be hopeful, i reckon the ...	neutral	noon	60-70	Aze
11	16fab9f95b	I really really like the song Love Story by Ta...	like	positive	night	70-100	Ba
12	74a76f6e0a	My Sharpie is running DANGERously low on ink	DANGERously	negative	morning	0-20	E
13	04dd1d2e34	i want to go to music tonight but i lost my vo...	lost	negative	noon	21-30	Bang
14	bbe3cbf620	test test from the LG enV2	test test from the LG enV2	neutral	night	31-45	Ba

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

```
Out[4]: textID              0
        text                1
        selected_text       1
        sentiment           0
        Time of Tweet       0
        Age of User         0
        Country             0
        Population -2020    0
        Land Area (Km²)     0
        Density (P/Km²)     0
        dtype: int64
```

```
In [5]: data_train['sentiment'].value_counts()
```

```
Out[5]: neutral     11118
        positive     8582
        negative     7781
        Name: sentiment, dtype: int64
```

```
In [6]: data_train.dropna(inplace=True)
```

```
In [55]: stop = stopwords.words('english')
         stop+=['im','u']
         stop.remove('not')
```

```
In [8]: WNL=WordNetLemmatizer()
```

```
In [9]: data_train.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 27480 entries, 0 to 27480
Data columns (total 10 columns):
 #   Column            Non-Null Count  Dtype  
---  ------            --------------  -----  
 0   textID            27480 non-null  object 
 1   text              27480 non-null  object 
 2   selected_text     27480 non-null  object 
 3   sentiment         27480 non-null  object 
 4   Time of Tweet     27480 non-null  object 
 5   Age of User       27480 non-null  object 
 6   Country           27480 non-null  object 
 7   Population -2020  27480 non-null  int64  
 8   Land Area (Km²)   27480 non-null  float64
 9   Density (P/Km²)   27480 non-null  int64  
dtypes: float64(1), int64(2), object(7)
memory usage: 2.3+ MB
```

```
In [10]: tt = TweetTokenizer()
```

```
In [11]: def preprocessing(dat):
             pre=[]
             # Remove Leading Blank Spaces
             temp = dat.strip()
             # Lower Case
             temp = temp.lower()
             # Remove URLS
             temp = re.sub(r"https?://\S+|www\.\S+", "", temp)
             # Character normalization // rahulllllleeeeee -> rahul
             temp = re.sub(r"([a-zA-Z])\1{2,}", r'\1', temp)
             # Remove UserName
             temp = re.sub(r"@\w+", "", temp)
             #removing special characters
             temp=re.sub(r'[^a-zA-Z\s]','',temp)
             #Tweet tokenizer is used for better tokenization since it is a twitter corpus
```

```
    temp = tt.tokenize(temp)
    for i in temp:
        if(i not in stop):
            pre += [i]
    return pre,' '.join(pre)
```

In [56]:
```
preprocess=[]
corpus = []
vocab = []
for i in data_train['text']:
    x,y = preprocessing(i)
    corpus+=[x]
    vocab+=x
    preprocess+=[y]
```

In [57]:
```
data_test = pd.read_csv('test.csv',encoding='unicode_escape')
data_test.dropna(inplace=True)
```

In [59]:
```
data_test['sentiment'].value_counts()
```

Out[59]:
```
neutral     1430
positive    1103
negative    1001
Name: sentiment, dtype: int64
```

In [60]:
```
preprocess_test=[]
corpus_test = []
vocab_test = []
for i in data_test['text']:
    x,y = preprocessing(i)
    corpus_test+=[x]
    vocab_test+=x
    preprocess_test+=[y]
```

In [61]:
```
data_train['preprocess'] = preprocess
data_test['preprocess']=preprocess_test

x_train = data_train['preprocess']

x_test = data_test['preprocess']
```

In [62]:
```
corpus_total = corpus_test+corpus
vocab = set(vocab)
```

In [63]:
```
testing_data = preprocessing(data_test['text'][102])
testing_value = data_test['sentiment'][102]
```

In [64]:
```
testing_data[1]
```

Out[64]:
```
'great study time followed delicious japanese meal arty trying get back study mood'
```

In [65]:
```
from sklearn.preprocessing import LabelEncoder

encoder = LabelEncoder()
y_train = encoder.fit_transform(data_train["sentiment"])
y_test = encoder.transform(data_test["sentiment"])
```

BOW

Train DATA

```
In [20]: from sklearn.feature_extraction.text import TfidfVectorizer,CountVectorizer
         CV= CountVectorizer()
```

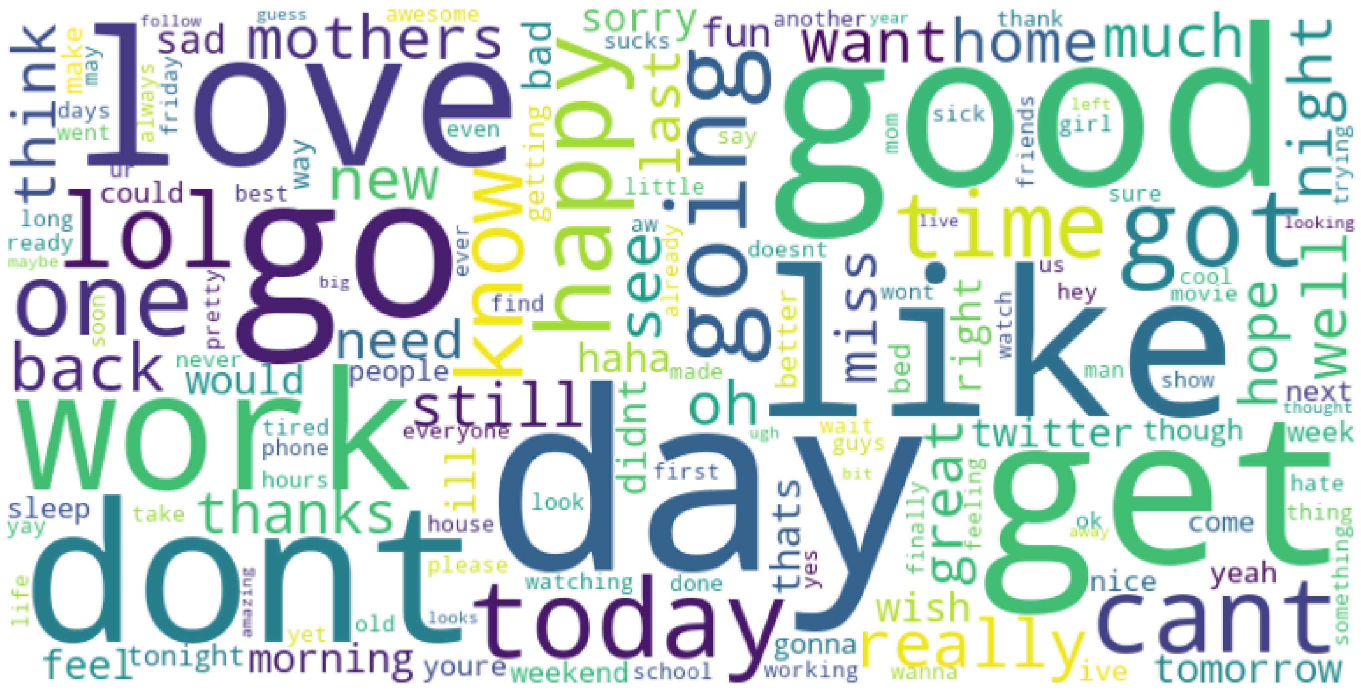
```
In [21]: count_vector_words_train = CV.fit_transform(data_train['preprocess'])
```

```
In [22]: Countwords_train = dict(zip(CV.get_feature_names_out(), count_vector_words_train.sum(axi
         sorted_bag_train = {key: val for key, val in sorted(Countwords_train.items(), key = lamb
         top_words_train = dict(list(sorted_bag_train.items())[0: 150])
         least_words_train = {key: val for key, val in sorted(Countwords_train.items(), key = lam
```

```
In [23]: import wordcloud
         wordcloud = wordcloud.WordCloud(width=800, height=400, background_color='white').generat

         # Display the word cloud using matplotlib
         plt.figure(figsize=(10, 5))
         plt.imshow(wordcloud, interpolation='bilinear')
         plt.axis('off')
         plt.title('Bag of Words - Word Cloud')
         plt.show()
```

Bag of Words - Word Cloud



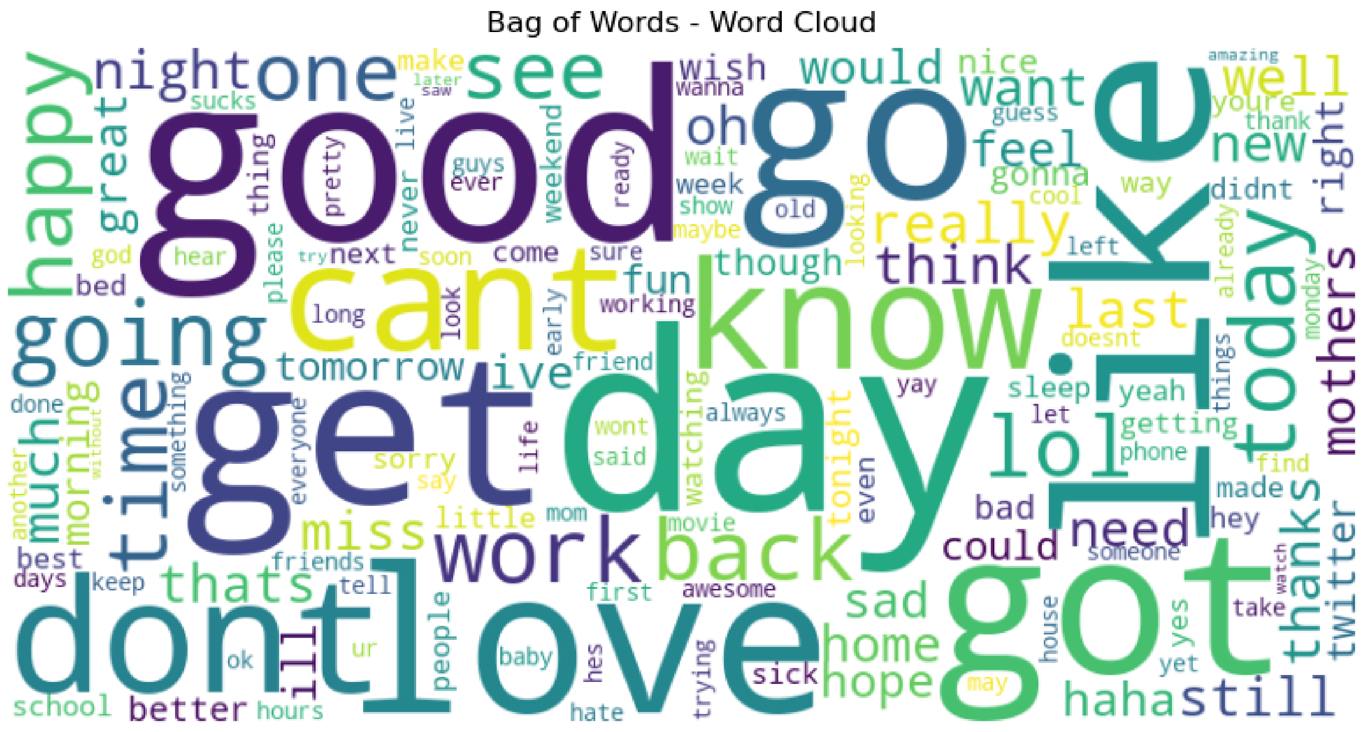
Test Data

```
In [24]: count_vector_words_test = CV.transform(data_test['preprocess'])
```

```
In [25]: Countwords_test = dict(zip(CV.get_feature_names_out(), count_vector_words_test.sum(axis=
         sorted_bag_test = {key: val for key, val in sorted(Countwords_test.items(), key = lambda
         top_words_test = dict(list(sorted_bag_test.items())[0: 150])
         least_words_test = {key: val for key, val in sorted(Countwords_test.items(), key = lambd
```

```
In [26]: import wordcloud
         wordcloud = wordcloud.WordCloud(width=800, height=400, background_color='white').generat

         # Display the word cloud using matplotlib
         plt.figure(figsize=(10, 5))
         plt.imshow(wordcloud, interpolation='bilinear')
         plt.axis('off')
plt.title('Bag of Words - Word Cloud')
plt.show()
```



BOW MODEL - Naive Bayes

In [29]:
```
from sklearn.naive_bayes import MultinomialNB
MNB = MultinomialNB()
MNB.fit(count_vector_words_train,y_train)
y_pred = MNB.predict(count_vector_words_test)
print(classification_report(y_true=y_test,y_pred=y_pred))
```

```
              precision    recall  f1-score   support

           0       0.68      0.59      0.63      1001
           1       0.60      0.68      0.63      1430
           2       0.72      0.68      0.70      1103

    accuracy                           0.65      3534
   macro avg       0.67      0.65      0.66      3534
weighted avg       0.66      0.65      0.66      3534
```

TF - IDF

In [30]:
```
tf = TfidfVectorizer()
```

In [31]:
```
X_train = tf.fit_transform(x_train)
X_test = tf.transform(x_test)
```

TF - IDF -> Naive Bayes

In [32]:
```
MNB = MultinomialNB()
MNB.fit(X_train,y_train)
y_pred = MNB.predict(X_test)
print(classification_report(y_test,y_pred))
print(MNB.predict(tf.transform([testing_data[1]])))
print(testing_value)
```

```
              precision    recall  f1-score   support

           0       0.77      0.44      0.56      1001
           1       0.54      0.81      0.65      1430
           2       0.77      0.58      0.66      1103

    accuracy                           0.63      3534
   macro avg       0.70      0.61      0.62      3534
weighted avg       0.68      0.63      0.63      3534

[2]
positive
```

Word To Vec

In [33]:
```
from gensim.models import Word2Vec
```

In [34]:
```
def vov(words,model):
    for word in words:
        if word not in model.wv:
            return False
    else:
        return True
```

SKIP GRAM

In [35]:
```
model1 = Word2Vec(corpus, min_count=1,vector_size=100, window=5,workers=5,sg=1,epochs=10
```

In [36]:
```
train_vec = [model1.wv[x].sum(axis = 0) if len(x) and vov(x,model1) else np.zeros((100))
test_vec  = [model1.wv[x].sum(axis = 0) if len(x) and vov(x,model1) else np.zeros((100))
test_dat  = [model1.wv[x].sum(axis = 0) if len(x) and vov(x,model1) else np.zeros((100))
```

In [37]:
```
from sklearn.linear_model import LogisticRegression
LR = LogisticRegression()
LR.fit(train_vec,y_train)
y_pred = LR.predict(test_vec)
print(classification_report(y_test,y_pred))
print(LR.predict(test_dat))
print(testing_value)
```

```
              precision    recall  f1-score   support

           0       0.68      0.28      0.39      1001
           1       0.46      0.83      0.59      1430
           2       0.68      0.33      0.44      1103

    accuracy                           0.52      3534
   macro avg       0.61      0.48      0.48      3534
weighted avg       0.59      0.52      0.49      3534

[2]
positive
```

CBOW

In [38]:
```
model2 = Word2Vec(corpus, min_count=1, vector_size=100,window=5,workers=5,epochs=100)
```

```
In [39]: train_vec = [model2.wv[x].sum(axis = 0) if len(x) and vov(x,model2) else np.zeros((100))
         test_vec  = [model2.wv[x].sum(axis = 0) if len(x) and vov(x,model2) else np.zeros((100))
         test_dat  = [model2.wv[x].sum(axis = 0) if len(x) and vov(x,model2) else np.zeros((100))
```

```
In [40]: from sklearn.linear_model import LogisticRegression
         LR = LogisticRegression()
         LR.fit(train_vec,y_train)
         y_pred = LR.predict(test_vec)
         print(classification_report(y_test,y_pred))
         print(LR.predict(test_dat))
         print(testing_value)
```

```
              precision    recall  f1-score   support

           0       0.69      0.31      0.43      1001
           1       0.48      0.84      0.61      1430
           2       0.74      0.37      0.50      1103

    accuracy                           0.54      3534
   macro avg       0.64      0.51      0.51      3534
weighted avg       0.62      0.54      0.52      3534

 [1]
positive
```

```
C:\Users\edith\anaconda3\lib\site-packages\sklearn\linear_model\_logistic.py:458: Conver
genceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
Please also refer to the documentation for alternative solver options:
    https://scikit-learn.org/stable/modules/linear_model.html#logistic-regression
  n_iter_i = _check_optimize_result(
```

```
In [ ]:
```

```
In [41]: import gensim.downloader as api
```

```
In [42]: glove = api.load('glove-twitter-100')
```

```
In [43]: def vov(words,model):
             for word in words:
                 if word not in model:
                     return False
             else:
                 return True
```

```
In [44]: train_vec = [glove[x].sum(axis = 0) if len(x) and vov(x,glove) else np.zeros((100)) for
         test_vec  = [glove[x].sum(axis = 0) if len(x) and vov(x,glove) else np.zeros((100)) for
         test_dat  = [glove[x].sum(axis = 0) if len(x) and vov(x,glove) else np.zeros((100)) for
```

```
In [45]: from sklearn.linear_model import LogisticRegression
         LR = LogisticRegression()
         LR.fit(train_vec,y_train)
         y_pred = LR.predict(test_vec)
         print(classification_report(y_test,y_pred))
         print(LR.predict(test_dat))
         print(testing_value)
```

```
              precision    recall  f1-score   support

           0       0.70      0.52      0.59      1001
           1       0.56      0.75      0.64      1430
           2       0.73      0.59      0.65      1103

    accuracy                           0.63      3534
   macro avg       0.66      0.62      0.63      3534
weighted avg       0.65      0.63      0.63      3534

[2]
positive
```

```
C:\Users\edith\anaconda3\lib\site-packages\sklearn\linear_model\_logistic.py:458: Conver
genceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
Please also refer to the documentation for alternative solver options:
    https://scikit-learn.org/stable/modules/linear_model.html#logistic-regression
  n_iter_i = _check_optimize_result(
```

TF-IDF Prediction

In [71]:
```
text = """What is not to like about this product.
Not bad.
Not an issue.
Not buggy.
Not happy.
Not user-friendly.
Not good.
Is it any good?
I do not dislike horror movies.
Disliking horror movies is not uncommon.
Sometimes I really hate the show.
I love having to wait two months for the next series to come out!
The final episode was surprising with a terrible twist at the end.
The film was easy to watch but I would not recommend it to my friends.
I LOL’d at the end of the cake scene."""
```

In [72]:
```
input_text = text.split("\n")
input_text = [preprocessing(string)[1] for string in input_text]
```

In [73]:
```
input_text
```

Out[73]:
```
['not like product',
 'not bad',
 'not issue',
 'not buggy',
 'not happy',
 'not userfriendly',
 'not good',
 'good',
 'not dislike horror movies',
 'disliking horror movies not uncommon',
 'sometimes really hate show',
 'love wait two months next series come',
 'final episode surprising terrible twist end',
 'film easy watch would not recommend friends',
 'lold end cake scene']
```

In [74]:
```
from sklearn.feature_extraction.text import TfidfVectorizer

tf_idf = TfidfVectorizer()

X_train = tf.fit_transform(x_train)
X_test = tf.transform(input_text)
```

In [75]:
```
model = LogisticRegression(max_iter = 1000)
model.fit(X_train, y_train)

predict = model.predict(X_test)
predict = encoder.inverse_transform(predict)
```

In [76]:
```
for index, text in enumerate(text.split("\n")):
    print(text, " : ", predict[index])
```

```
What is not to like about this product.  :  negative
Not bad.  :  negative
Not an issue.  :  negative
Not buggy.  :  neutral
Not happy.  :  positive
Not user-friendly.  :  negative
Not good.  :  positive
Is it any good?  :  positive
I do not dislike horror movies.   :  negative
Disliking horror movies is not uncommon.   :  negative
Sometimes I really hate the show.   :  negative
I love having to wait two months for the next series to come out!   :  positive
The final episode was surprising with a terrible twist at the end.  :  neutral
The film was easy to watch but I would not recommend it to my friends.   :  neutral
I LOL’d at the end of the cake scene.  :  neutral
```