Import modules

In [1]:
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import re
import nltk
from nltk.stem.porter import PorterStemmer
import nlp
import random
import tensorflow as tf
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Dense, Dropout, LSTM
import warnings
import seaborn as sns

%matplotlib inline

warnings.filterwarnings('ignore')
```

Loading the dataset

In [2]:
```
df = pd.read_csv("Twitter Sentiments.csv")
df.head()
```

Out[2]:

	id	label	tweet
0	1	0	@user when a father is dysfunctional and is s...
1	2	0	@user @user thanks for #lyft credit i can't us...
2	3	0	bihday your majesty
3	4	0	#model i love u take with u all the time in ...
4	5	0	factsguide: society now #motivation

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

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 31962 entries, 0 to 31961
Data columns (total 3 columns):
 #   Column  Non-Null Count  Dtype 
---  ------  --------------  ----- 
 0   id      31962 non-null  int64 
 1   label   31962 non-null  int64 
 2   tweet   31962 non-null  object
dtypes: int64(2), object(1)
memory usage: 749.2+ KB
```

Preprocessing dataset

In [4]:
```
tweet = df["tweet"]
```

In [5]:
```
# nltk.download('stopwords')
from nltk.corpus import stopwords

courp = []
for i in range(0, np.shape(tweet)[0]):
    review = re.sub(r'\s*[@]+\w+\s*', '', tweet[i])
    review = re.sub(r'((www.[^s]+)|(https?://[^s]+))','',review)
    review = re.sub('[^a-zA-Z#]', ' ', review)
    review = review.lower( )
    review = review.split()
    ps = PorterStemmer()
    review = [ps.stem(word) for word in review]
    review = ' '.join(review)
    courp.append(review)
df["clean_tweet"] = pd.DataFrame(courp)
```

In [6]:
```
df.head()
```

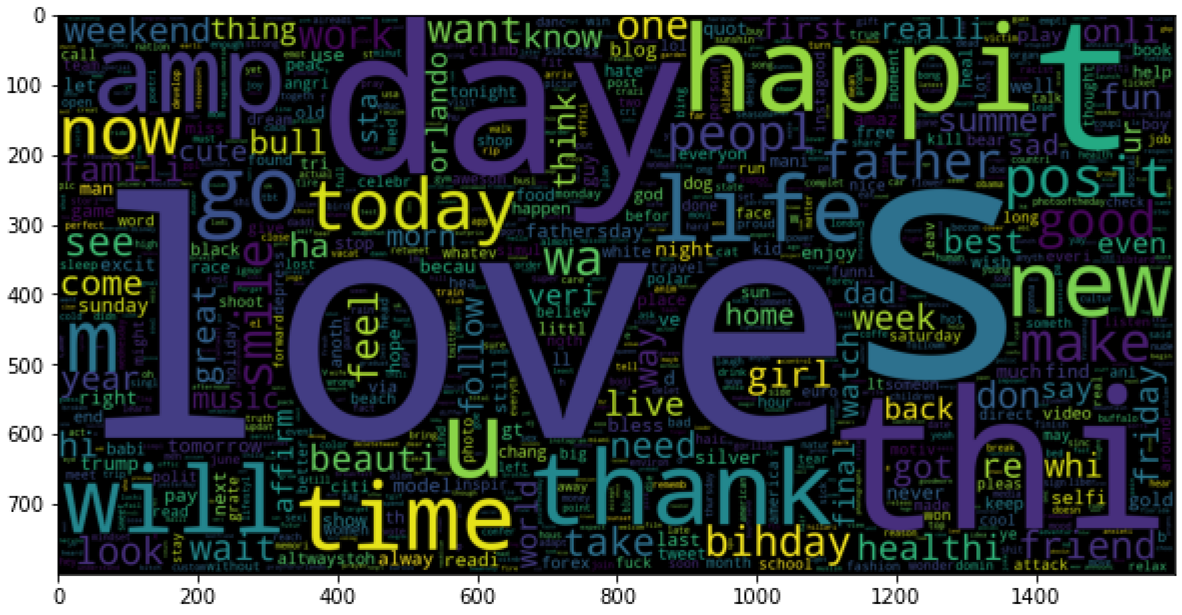
Out[6]:

	id	label	tweet	clean_tweet
0	1	0	@user when a father is dysfunctional and is s...	when a father is dysfunct and is so selfish he...
1	2	0	@user @user thanks for #lyft credit i can't us...	thank for #lyft credit i can t use caus they d...
2	3	0	bihday your majesty	bihday your majesti
3	4	0	#model i love u take with u all the time in ...	#model i love u take with u all the time in ur
4	5	0	factsguide: society now #motivation	factsguid societi now #motiv

Exploratory Data Analysis

In [7]:
```
# All tweets
from wordcloud import WordCloud
all_tweets = " ".join([sentence for sentence in df['clean_tweet']])
plt.figure(figsize = (10,10))
wc = WordCloud(max_words = 1000 , width = 1600 , height = 800,
               collocations=False).generate(all_tweets)
plt.imshow(wc)
```

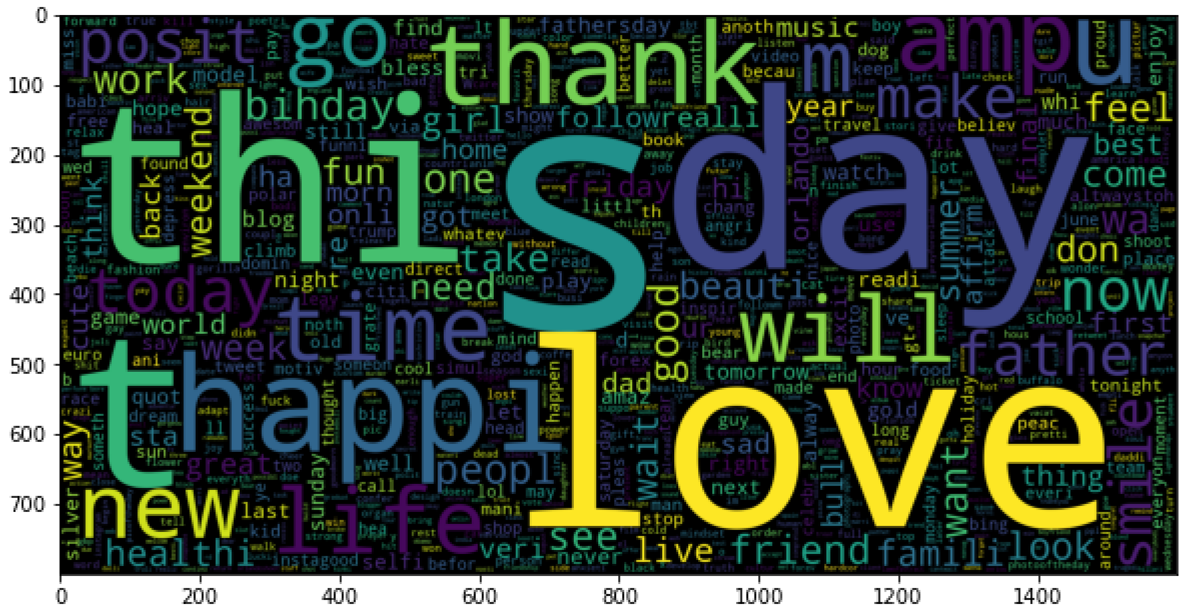
Out[7]:
```
<matplotlib.image.AxesImage at 0x273aaa863a0>
```



In [8]:
```
# frequent words visualization for +ve
positive_tweets = " ".join([sentence for sentence in df['clean_tweet'][df['label'

plt.figure(figsize = (10,10))
wc = WordCloud(max_words = 1000 , width = 1600 , height = 800,
               collocations=False).generate(positive_tweets)
plt.imshow(wc)
```

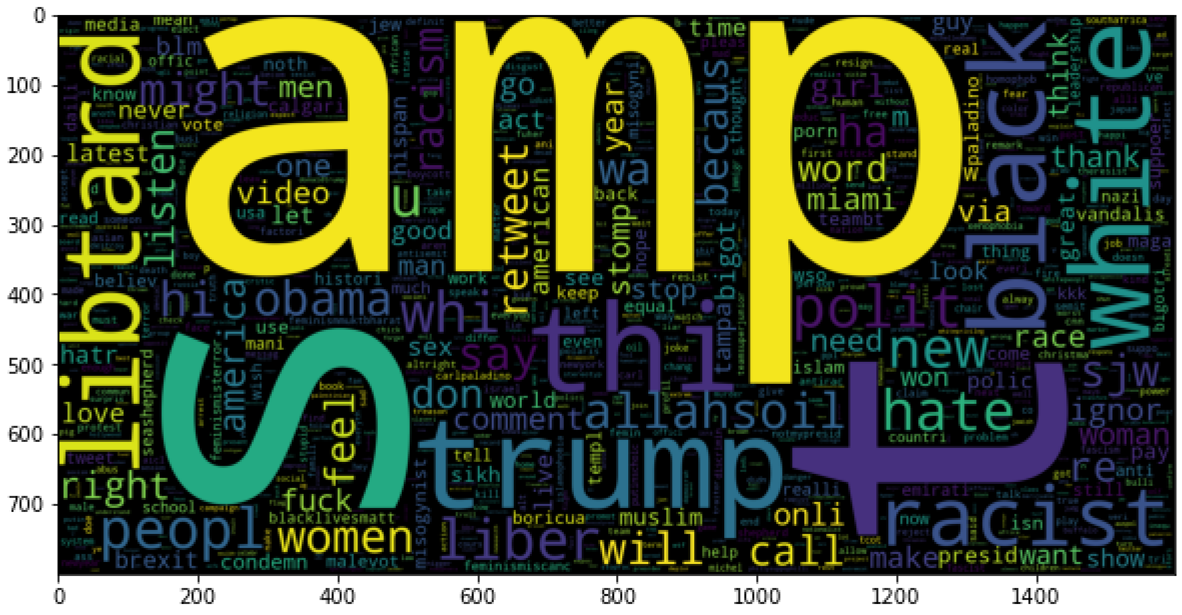
Out[8]:
```
<matplotlib.image.AxesImage at 0x273aaa474c0>
```



In [9]:
```
# frequent words visualization for -ve
positive_tweets = " ".join([sentence for sentence in df['clean_tweet'][df['label'

plt.figure(figsize = (10,10))
wc = WordCloud(max_words = 1000 , width = 1600 , height = 800,
               collocations=False).generate(positive_tweets)
plt.imshow(wc)
```

Out[9]:
```
<matplotlib.image.AxesImage at 0x273aaa2f250>
```



In [10]:
```
# extract the hashtag
def hashtag_extract(tweets):
    hashtags = []
    # loop words in the tweet
    for tweet in tweets:
        ht = re.findall(r"#(\w+)", tweet)
        hashtags.append(ht)
    return hashtags
```

In [11]:
```
# extract hashtags from non-racist/sexist tweets
positive_ht = hashtag_extract(df['tweet'][df['label']==0])

# extract hashtags from racist/sexist tweets
negative_ht = hashtag_extract(df['tweet'][df['label']==1])
```

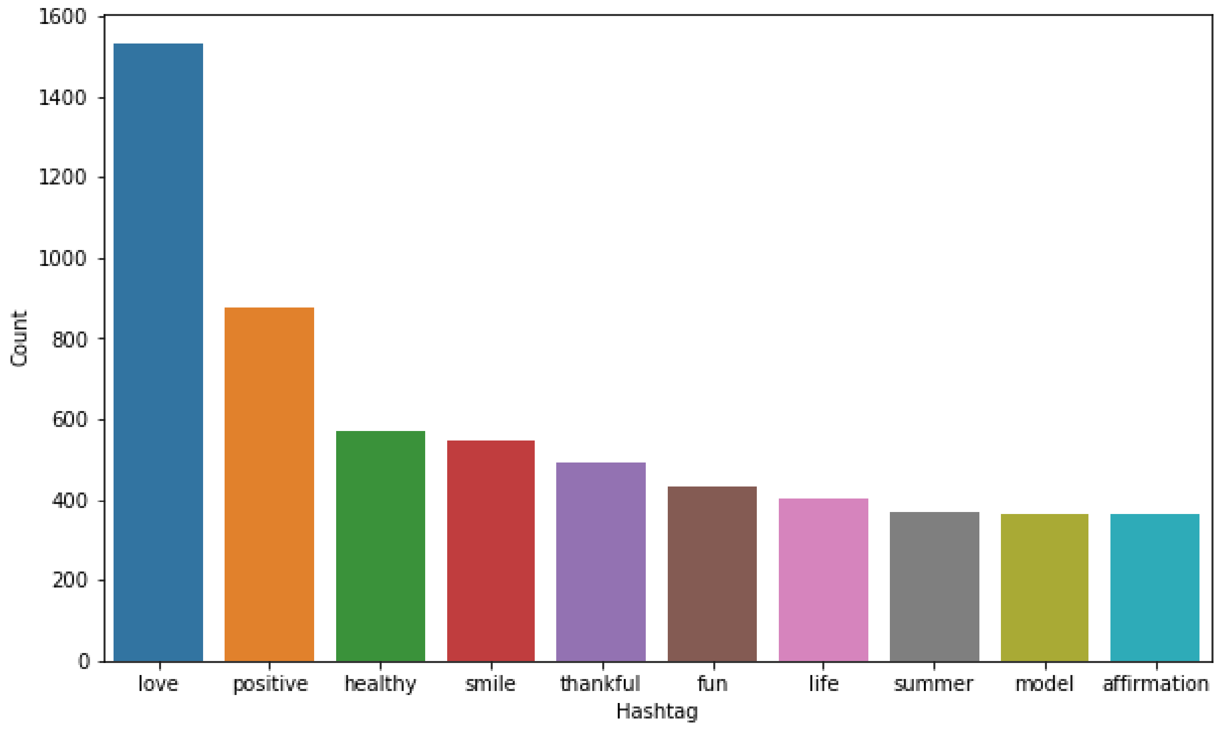
In [12]:
```
ht_positive = sum(positive_ht, [])
ht_negative = sum(negative_ht, [])
```

In [13]:
```
freq = nltk.FreqDist(ht_positive)
d = pd.DataFrame({'Hashtag': list(freq.keys()),
                  'Count': list(freq.values())})
d.head()
```

Out[13]:

	Hashtag	Count
0	run	33
1	lyft	2
2	disapointed	1
3	getthanked	2
4	model	364

In [14]:
```
# select top 10 positive hashtags
d = d.nlargest(columns='Count', n=10)
plt.figure(figsize=(10,6))
sns.barplot(data=d, x='Hashtag', y='Count')
plt.show()
```

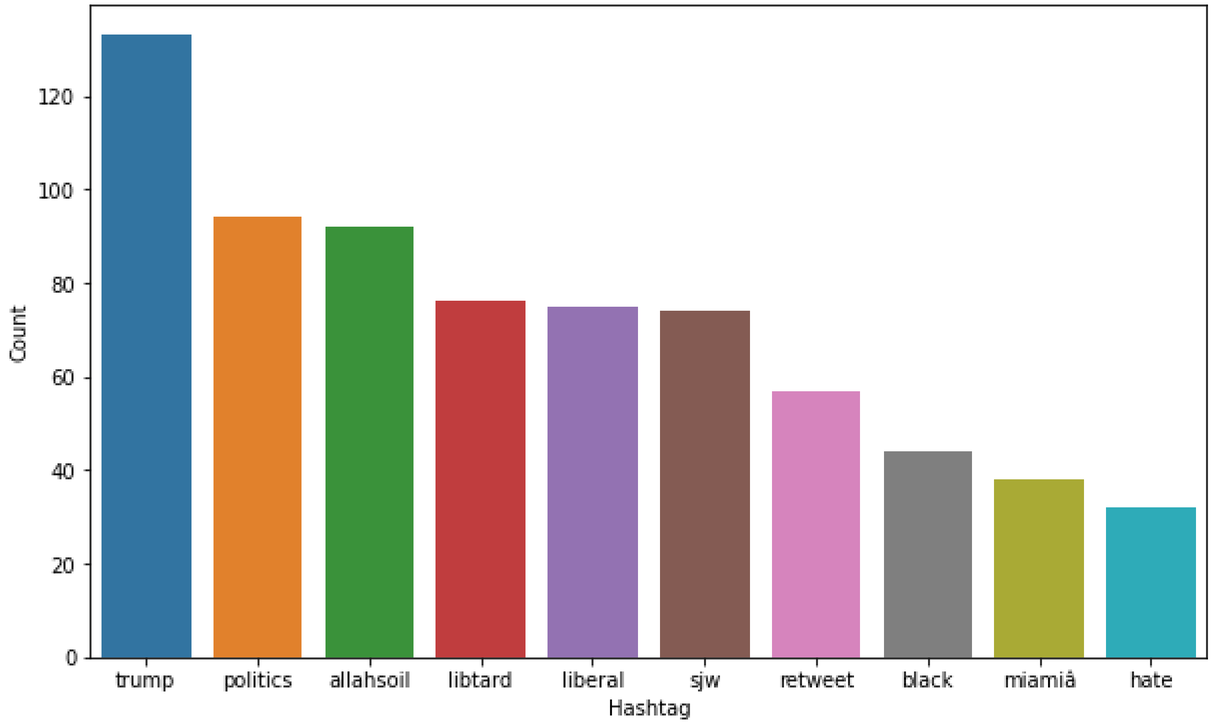


In [15]:
```
freq = nltk.FreqDist(ht_negative)
d = pd.DataFrame({'Hashtag': list(freq.keys()),
                  'Count': list(freq.values())})
d.head()
```

Out[15]:

	Hashtag	Count
0	cnn	9
1	michigan	2
2	tcot	14
3	australia	6
4	opkillingbay	2

In [16]:
```
# select top 10 negative hashtags
d = d.nlargest(columns='Count', n=10)
plt.figure(figsize=(10,6))
sns.barplot(data=d, x='Hashtag', y='Count')
plt.show()
```



Input Split

In [17]:
```
from sklearn.feature_extraction.text import CountVectorizer
cv = CountVectorizer(max_features = 1000)
X = cv.fit_transform(df['clean_tweet']).toarray()
```

In [18]:
```
y = df["label"].values
```

In [19]:
```
from sklearn.model_selection import train_test_split
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size = 0.2, randon
```

Train Model

In [20]:
```
from sklearn.linear_model import LogisticRegression
classifier = LogisticRegression(random_state = 0)
classifier.fit(X_train, y_train)
```

Out[20]:
```
LogisticRegression(random_state=0)
```

In [21]:
```
pred = classifier.predict(X_test)
print(np.concatenate((pred.reshape(len(pred),1), y_test.reshape(len(y_test),1)),1
```

```
[[0 0]
 [0 0]
 [0 0]
 ...
 [0 0]
 [0 0]
 [0 0]]
```

In [22]:
```
from sklearn.metrics import f1_score
f1_score(y_test, pred)
```

Out[22]:
```
0.5333333333333333
```

In [23]:
```
from sklearn.metrics import confusion_matrix, accuracy_score
cm = confusion_matrix(y_test, pred)
print(cm)
accuracy_score(y_test,pred)
```

```
[[5898   62]
 [ 253  180]]
```

Out[23]:
```
0.9507273580478649
```

In [24]:
```
# use probability to get output
pred_prob = classifier.predict_proba(X_test)
pred = pred_prob[:, 1] >= 0.3
pred = pred.astype(np.int)

f1_score(y_test, pred)
```

Out[24]:
```
0.5776699029126213
```

In [25]:
```
from sklearn.metrics import confusion_matrix, accuracy_score
cm = confusion_matrix(y_test, pred)
print(cm)
accuracy_score(y_test,pred)
```

```
[[5807  153]
 [ 195  238]]
```

Out[25]:
```
0.9455654622243078
```