In [1]:
```
pwd
```

Out[1]: 'C:\\Users\\MANAY'

In [2]:
```
import re
#regular expression: provide regular matching operations;RegEx is a sequence o
f characters that forms a search pattern.
```

In [3]:
```
import pandas as pd
#data manipulation and analysis tool using its powerful data structures
import numpy as np
#general purpose array-processing package,it provide high performance multidim
ensional array object and tools working on it.
import matplotlib.pyplot as plt
import seaborn as sns
#it will bw used in making statistical graphics
import string
#strings in Python are arrays of bytes representing unicode characters
import nltk
#for working with human language data processing
import warnings
#This is the base class of all warning category classes. It handles waring. Pr
ogram doesn't terminate when warning is encountered
warnings.filterwarnings("ignore", category=DeprecationWarning)
#ignoring disapproval warnings
%matplotlib inline
```

In [4]:
```
train  = pd.read_csv('train_E6oV3lV.csv')
test = pd.read_csv('test_tweets_anuFYb8.csv')
```

In [5]:
```
train.head()
```

Out[5]:

	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 [6]:
```
#label is the target variable
#tweet contains the tweets that we will clean and preprocess
```

In [7]:

```
# 1.we will try to get rid of the punctuations,numbers and special characters.
# 2.small words are of no use as they do not add much value e.g. your, all, th
e, and. we will try to remove them.
# 3.executed the above steps, we can split every tweet into individual words o
r tokens.
# which is an essential step in any NLP task.
# 4. We will reduce loves, loving, lovable etc in the data to "love".
# Then we can reduce the total number of unique words in our data without losi
ng a significant amount of information.
```

Removing Twitter Handle

In [8]:

```
combi = train.append(test, ignore_index=True)
#append train and test to remove @user at a time, just reducing the task
```

```
C:\Users\MANAY\Anaconda3\lib\site-packages\pandas\core\frame.py:6201: FutureW
arning: Sorting because non-concatenation axis is not aligned. A future versi
on
of pandas will change to not sort by default.

To accept the future behavior, pass 'sort=True'.

To retain the current behavior and silence the warning, pass sort=False

  sort=sort)
```

In [9]:

```
combi.head()
```

Out[9]:

	id	label	tweet
0	1	0.0	@user when a father is dysfunctional and is s...
1	2	0.0	@user @user thanks for #lyft credit i can't us...
2	3	0.0	bihday your majesty
3	4	0.0	#model i love u take with u all the time in ...
4	5	0.0	factsguide: society now #motivation

In [10]:

```
def remove_pattern(input_txt, pattern):
    r=re.findall(pattern, input_txt)
    for i in r:
        input_txt= re.sub(i,'',input_txt)

    return input_txt
```

remove tweetter handles (@user)

In [12]:
```
combi['tidy_tweet'] = np.vectorize(remove_pattern)(combi['tweet'], "@[\w]*")
#
```

Remove punctuations, numbers, punctuations

In [13]:
```
# remove special characters, numbers, punctuations
combi['tidy_tweet'] = combi['tidy_tweet'].str.replace("[^a-zA-Z#]", " ")
```

In [14]:
```
combi.head()
```

Out[14]:

	id	label	tweet	tidy_tweet
0	1	0.0	@user when a father is dysfunctional and is s...	when a father is dysfunctional and is so sel...
1	2	0.0	@user @user thanks for #lyft credit i can't us...	thanks for #lyft credit i can t use cause th...
2	3	0.0	bihday your majesty	bihday your majesty
3	4	0.0	#model i love u take with u all the time in ...	#model i love u take with u all the time in ...
4	5	0.0	factsguide: society now #motivation	factsguide society now #motivation

Removing short words

In [15]:
```
combi['tidy_tweet'] = combi['tidy_tweet'].apply(lambda x: ' '.join([w for w in
x.split() if len(w)>3]))
```

In [16]:
```
combi.head()
```

Out[16]:

	id	label	tweet	tidy_tweet
0	1	0.0	@user when a father is dysfunctional and is s...	when father dysfunctional selfish drags kids i...
1	2	0.0	@user @user thanks for #lyft credit i can't us...	thanks #lyft credit cause they offer wheelchai...
2	3	0.0	bihday your majesty	bihday your majesty
3	4	0.0	#model i love u take with u all the time in ...	#model love take with time
4	5	0.0	factsguide: society now #motivation	factsguide society #motivation

Tokenization

In [17]:
```
#tolenization all the cleaned tweets in our dataset--splitting a string of tex
t into tokens
tokenized_tweet = combi['tidy_tweet'].apply(lambda x: x.split())
```

In [18]:
```
tokenized_tweet.head()
```

Out[18]:
```
0    [when, father, dysfunctional, selfish, drags, ...
1    [thanks, #lyft, credit, cause, they, offer, wh...
2                              [bihday, your, majesty]
3                     [#model, love, take, with, time]
4                   [factsguide, society, #motivation]
Name: tidy_tweet, dtype: object
```

Stemming

In [19]:
```
#Stemming is a rule based process of stripping the suffixes ("ing","ly","e
s","s" etc) from a word
from nltk.stem.porter import *
stemmer = PorterStemmer()

tokenized_tweet = tokenized_tweet.apply(lambda x: [stemmer.stem(i) for i in x
])   #stemming.
```

In [20]:
```
tokenized_tweet.head()
```

Out[20]:
```
0    [when, father, dysfunct, selfish, drag, kid, i...
1    [thank, #lyft, credit, caus, they, offer, whee...
2                              [bihday, your, majesti]
3                     [#model, love, take, with, time]
4                         [factsguid, societi, #motiv]
Name: tidy_tweet, dtype: object
```

In [21]:
```
for i in range(len(tokenized_tweet)):
    tokenized_tweet[i]=' '.join(tokenized_tweet[i])

combi['tidy_tweet']=tokenized_tweet
```

In [22]:
```
combi.head()
```

Out[22]:

	id	label	tweet	tidy_tweet
0	1	0.0	@user when a father is dysfunctional and is s...	when father dysfunct selfish drag kid into dys...
1	2	0.0	@user @user thanks for #lyft credit i can't us...	thank #lyft credit caus they offer wheelchair ...
2	3	0.0	bihday your majesty	bihday your majesti
3	4	0.0	#model i love u take with u all the time in ...	#model love take with time
4	5	0.0	factsguide: society now #motivation	factsguid societi #motiv

Story Generation and Visualization from tweets

Understanding the common words used in the tweets: WordCloud

In [23]:
```
all_words=' '.join([text for text in combi['tidy_tweet']])
```

In [24]:
```
from wordcloud import WordCloud
```

In [25]:
```
wordcloud=WordCloud(width=800, height=500,random_state=21, max_font_size=110).
generate(all_words)
```

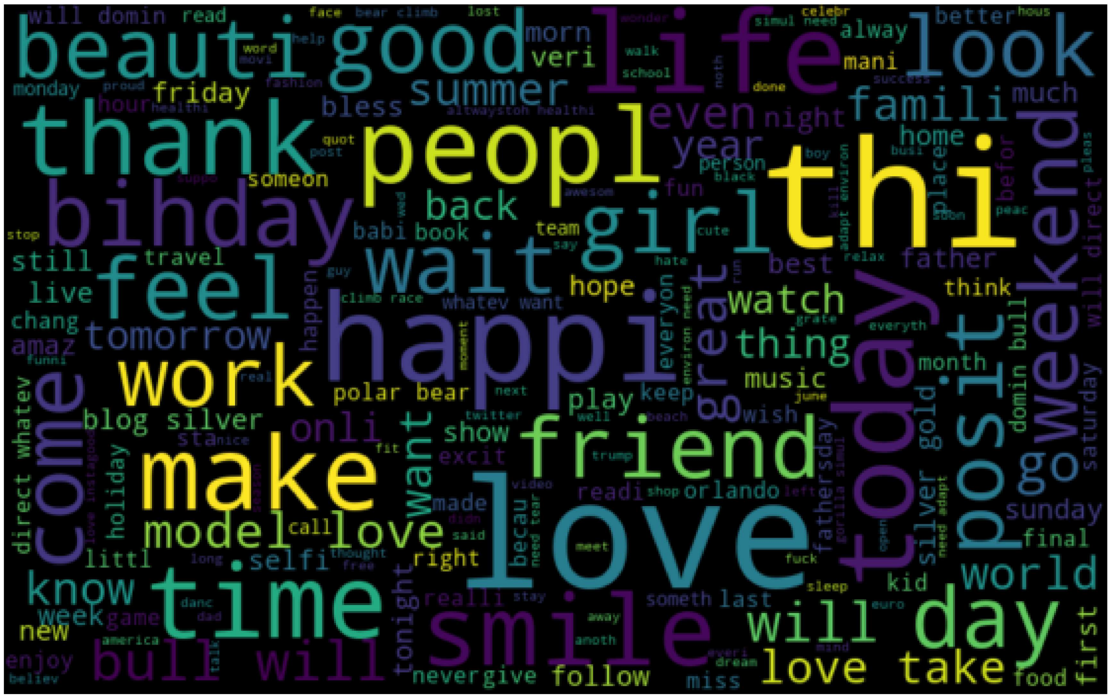
In [26]:
```
plt.figure(figsize=(10,7))
plt.imshow(wordcloud, interpolation="bilinear")
plt.axis('off')
plt.show()
```

Words in non racist/sexist tweets

In [27]:
```
normal_words=''.join([text for text in combi['tidy_tweet'][combi['label'] == 0
]])
```

In [28]:
```
wordcloud=WordCloud(width=800, height=500,random_state=21, max_font_size=110).
generate(normal_words)
```

In [29]:
```
plt.figure(figsize=(10,7))
plt.imshow(wordcloud, interpolation="bilinear")
plt.axis('off')
plt.show()
```

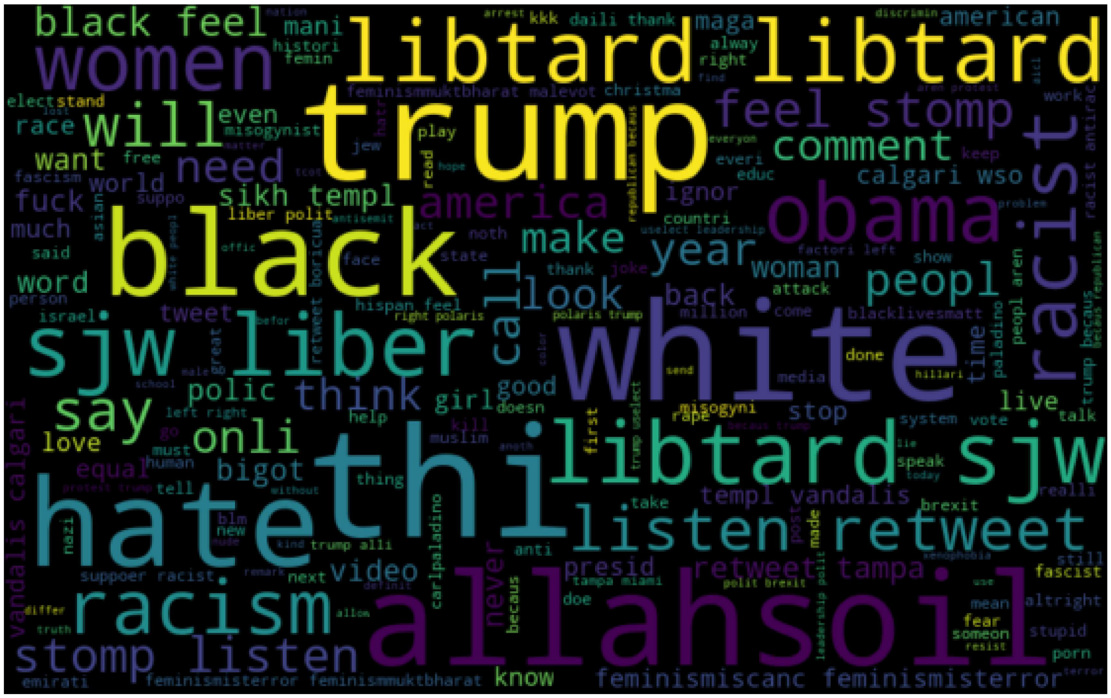


Racist/Sexist Tweets

In [30]:
```
negative_words=''.join([text for text in combi['tidy_tweet'][combi['label'] ==
1]])
```

In [31]:
```
wordcloud=WordCloud(width=800,height=500,random_state=21,max_font_size=110).ge
nerate(negative_words)
```

In [32]:
```
plt.figure(figsize=(10,7))
plt.imshow(wordcloud, interpolation="bilinear")
plt.axis('off')
plt.show()
```



Understanding the impact of Hashtags on tweets sentiment

#HASHTAG

In [33]:
```
#function to collect hashtags
def hashtag_extract(x):
    hashtags=[]
    for i in x:
        ht=re.findall(r"#(\w+)",i)
        hashtags.append(ht)

    return hashtags
```

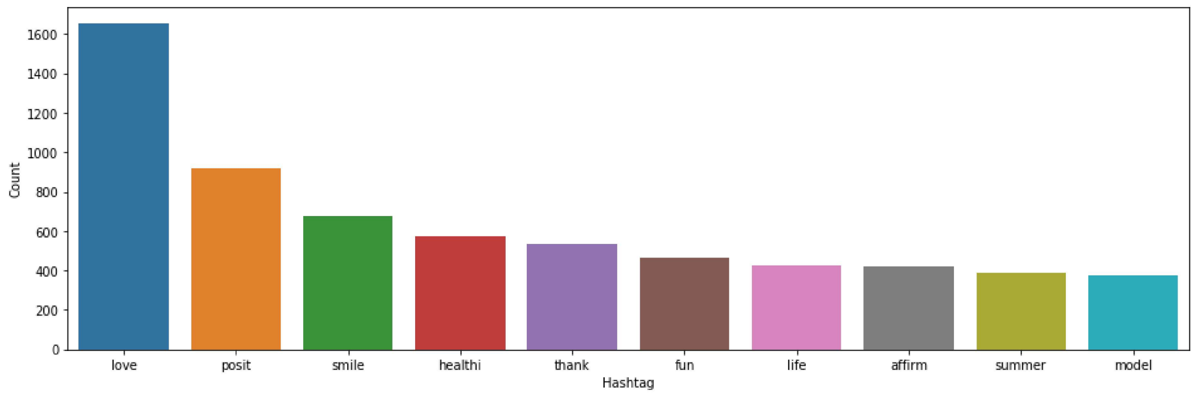
In [34]:
```
#extracting hashtag from non racist/sexist tweets
HT_regular = hashtag_extract(combi['tidy_tweet'][combi['label']==0])

#extracting hashtag from racist/sexist tweets
HT_negative = hashtag_extract(combi['tidy_tweet'][combi['label']==1])

#unnesting list
HT_regular = sum(HT_regular,[])
HT_negative = sum(HT_negative,[])
```

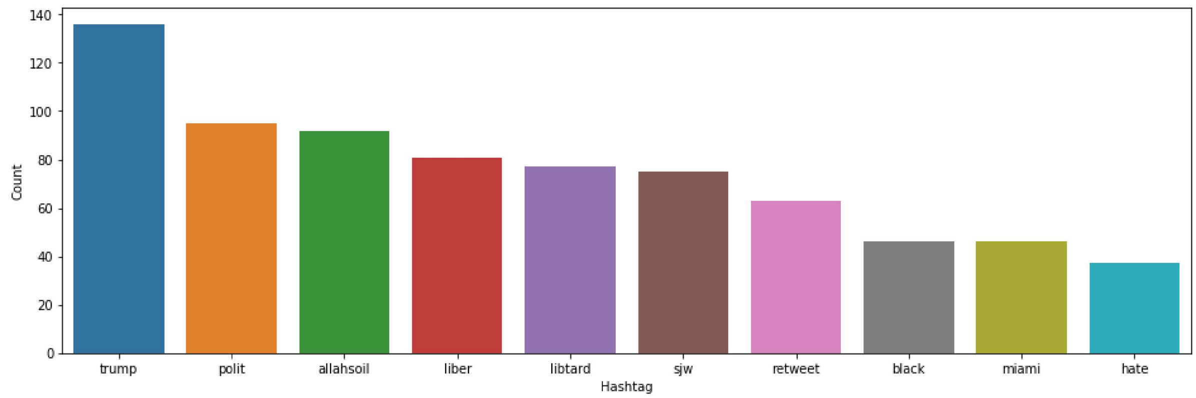
Non-Racist/Sexist Tweets

In [35]:
```
a=nltk.FreqDist(HT_regular)
d=pd.DataFrame({
    'Hashtag':list(a.keys()),
    'Count' : list(a.values())
})
#selecting top 10 most frequent hashtag
d= d.nlargest(columns="Count", n=10)
plt.figure(figsize=(16,5))
ax=sns.barplot(data=d,x='Hashtag', y='Count')
ax.set(ylabel = 'Count')
plt.show()
```



Racist/Sexist tweets

In [36]:
```
b = nltk.FreqDist(HT_negative)
e = pd.DataFrame({
    'Hashtag': list(b.keys()),
    'Count': list(b.values())
})
# selecting top 10 most frequent hashtags
e = e.nlargest(columns="Count", n = 10)
plt.figure(figsize=(16,5))
ax = sns.barplot(data=e, x= "Hashtag", y = "Count")
ax.set(ylabel = 'Count')
plt.show()
```



Extracting Features from Clean Tweets

Using assorted techniques - Bag-of-words & TF-IDF

Building model using Bag-of-Words features

In [37]:
```
from sklearn.feature_extraction.text import CountVectorizer
bow_vectorizer = CountVectorizer(max_df=0.90, min_df=2, max_features=1000, sto
p_words='english')
# bag-of-words feature matrix
bow = bow_vectorizer.fit_transform(combi['tidy_tweet'])
```

In [38]:
```
from sklearn.linear_model import LogisticRegression
from sklearn.model_selection import train_test_split
from sklearn.metrics import f1_score

train_bow = bow[:31962,:]
test_bow = bow[31962:,:]

# splitting data into training and validation set
xtrain_bow, xvalid_bow, ytrain, yvalid = train_test_split(train_bow, train['la
bel'], random_state=42, test_size=0.3)

lreg = LogisticRegression()
lreg.fit(xtrain_bow, ytrain) # training the model

prediction = lreg.predict_proba(xvalid_bow) # predicting on the validation set
prediction_int = prediction[:,1] >= 0.3 # if prediction is greater than or equ
al to 0.3 than 1 else 0
prediction_int = prediction_int.astype(np.int)

f1_score(yvalid, prediction_int) # calculating f1 score
```

Out[38]: 0.5307820299500832

In [39]:
```
test_pred = lreg.predict_proba(test_bow)
test_pred_int = test_pred[:,1] >= 0.3
test_pred_int = test_pred_int.astype(np.int)
test['label'] = test_pred_int
submission = test[['id','label']]
submission.to_csv('sub_lreg_bow.csv', index=False) # writing data to a CSV fil
e
```

Building Model using TF-IDF features

In [40]:
```
from sklearn.feature_extraction.text import TfidfVectorizer
tfidf_vectorizer = TfidfVectorizer(max_df=0.90, min_df=2, max_features=1000, s
top_words='english')
# TF-IDF feature matrix
tfidf = tfidf_vectorizer.fit_transform(combi['tidy_tweet'])
```

In [41]:
```
train_tfidf = tfidf[:31962,:]
test_tfidf = tfidf[31962:,:]

xtrain_tfidf = train_tfidf[ytrain.index]
xvalid_tfidf = train_tfidf[yvalid.index]

lreg.fit(xtrain_tfidf, ytrain)

prediction = lreg.predict_proba(xvalid_tfidf)
prediction_int = prediction[:,1] >= 0.3
prediction_int = prediction_int.astype(np.int)

f1_score(yvalid, prediction_int)
```

Out[41]:
```
0.5446507515473032
```