TWITTER DATA ANALYSIS

1. Download data set

In [1]:

```
!wget --header="Host: thinknook.com" --header="User-Agent: Mozilla/5.0
```

```
--2019-10-19 17:26:37--  http://thinknook.com/wp-content/uploads/2012/09/S
entiment-Analysis-Dataset.zip (http://thinknook.com/wp-content/uploads/201
2/09/Sentiment-Analysis-Dataset.zip)
Resolving thinknook.com (thinknook.com)... 208.109.47.128
Connecting to thinknook.com (thinknook.com)|208.109.47.128|:80... connecte
d.
HTTP request sent, awaiting response... 200 OK
Length: 56427677 (54M) [application/zip]
Saving to: ‘Sentiment-Analysis-Dataset.zip’

Sentiment-Analysis- 100%[===================>]  53.81M  13.3MB/s    in 6.3
s

2019-10-19 17:26:44 (8.59 MB/s) - ‘Sentiment-Analysis-Dataset.zip’ saved
[56427677/56427677]
```

In [2]:

```
!unzip Sentiment-Analysis-Dataset.zip
```

```
Archive:  Sentiment-Analysis-Dataset.zip
  inflating: Sentiment Analysis Dataset.csv
```

2.Import packages

In [0]:

```python
%matplotlib inline
import warnings
warnings.filterwarnings("ignore")

import sqlite3
import pandas as pd
import numpy as np
import nltk
import string
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.feature_extraction.text import TfidfTransformer
from sklearn.feature_extraction.text import TfidfVectorizer

from sklearn.feature_extraction.text import CountVectorizer
from sklearn.metrics import confusion_matrix
from sklearn import metrics
from sklearn.metrics import roc_curve, auc
from nltk.stem.porter import PorterStemmer

import re
# Tutorial about Python regular expressions: https://pymotw.com/2/re/
import string
from nltk.corpus import stopwords
from nltk.stem import PorterStemmer
from nltk.stem.wordnet import WordNetLemmatizer

from gensim.models import Word2Vec
from gensim.models import KeyedVectors
import pickle

from tqdm import tqdm
import os


```

3.Read data

In [4]:

```python
twitter_data=pd.read_csv('Sentiment_Analysis_Dataset.csv',error_bad_lir
```

```
b'Skipping line 8836: expected 4 fields, saw 5\n'
b'Skipping line 535882: expected 4 fields, saw 7\n'
```

In [5]:

```python
twitter_data
```

Out[5]:

	ItemID	Sentiment	SentimentSource	SentimentText
0	1	0	Sentiment140	is so sad for my APL frie...
1	2	0	Sentiment140	I missed the New Moon trail...
2	3	1	Sentiment140	omg its already 7:30 :O
3	4	0	Sentiment140	.. Omgaga. Im sooo im gunna CRy. I'...
4	5	0	Sentiment140	i think mi bf is cheating on me!!! ...
5	6	0	Sentiment140	or i just worry too much?
6	7	1	Sentiment140	Juuuuuuuuuuuuuuuuussssst Chillin!!
7	8	0	Sentiment140	Sunny Again Work Tomorrow :-| ...
8	9	1	Sentiment140	handed in my uniform today . i miss you ...
9	10	1	Sentiment140	hmmmm.... i wonder how she my number @-)

In [6]:

```
print(twitter_data['SentimentText'].values[0])
print("="*50)
print(twitter_data['SentimentText'].values[15])
print("="*50)
print(twitter_data['SentimentText'].values[100])
print("="*50)
print(twitter_data['SentimentText'].values[200])
print("="*50)
print(twitter_data['SentimentText'].values[10000])
print("="*50)
```

```
                     is so sad for my APL friend.............
==================================================
    &lt;-------- This is the way i feel right now...
==================================================
  no pavel tonight &lt;Tigersfan &gt;
==================================================
 @georgediaz #Magic ..thinking less than 50 % chance Hedo stays in Orland
o. He's gonna go for the $$. They all do. Can't blame him though.
==================================================
&quot;I feel like I'm playing Scrabble of... royalty.&quot; -@Bryan_Roush,
on my bitchin' board
==================================================
```

Stopwords

- we are not taking "Not,no,don't, etc" ind of words as they can be helpful here.

In [0]:

```
# https://gist.github.com/sebleier/554280
# we are removing the words from the stop words list: 'no', 'nor', 'not
stopwords= ['i', 'me', 'my', 'myself', 'we', 'our', 'ours', 'ourselves'
            "you'll", "you'd", 'your', 'yours', 'yourself', 'yourselves
            'she', "she's", 'her', 'hers', 'herself', 'it', "it's", 'it
            'theirs', 'themselves', 'what', 'which', 'who', 'whom', 'th
            'am', 'is', 'are', 'was', 'were', 'be', 'been', 'being', 'h
            'did', 'doing', 'a', 'an', 'the', 'and', 'but', 'if', 'or',
            'at', 'by', 'for', 'with', 'about', 'against', 'between', '
            'above', 'below', 'to', 'from', 'up', 'down', 'in', 'out',
            'then', 'once', 'here', 'there', 'when', 'where', 'why', 'h
            'most', 'other', 'some', 'such', 'only', 'own', 'same', 'so
            's', 't', 'can', 'will', 'just', 'should', "should've", 'no
            've', 'y', 'ain', 'aren']
```

Preprocessing the dataset.

- Repace all the abbrevation with full words.
- Remove twitter handles as they contain very less information.

In [0]:

```python
# https://stackoverflow.com/a/47091490/4084039
import re

def decontracted(phrase):
    # specific
    phrase = re.sub(r"won't", "will not", phrase)
    phrase = re.sub(r"can\'t", "can not", phrase)

    # general
    phrase = re.sub("\%", "", phrase)
    phrase = re.sub("\.", "", phrase)
    phrase = re.sub("\&", "", phrase)
    phrase=" ".join(filter(lambda x:x[0]!='@', phrase.split()))
    phrase = re.sub(r"n\'t", " not", phrase)
    phrase = re.sub(r"\'re", " are", phrase)
    phrase = re.sub(r"\'s", " is", phrase)
    phrase = re.sub(r"\'d", " would", phrase)
    phrase = re.sub(r"\'ll", " will", phrase)
    phrase = re.sub(r"\'t", " not", phrase)
    phrase = re.sub(r"\'ve", " have", phrase)
    phrase = re.sub(r"\'m", " am", phrase)
    phrase = phrase.replace('\\r', ' ')
    phrase = phrase.replace('\\"', ' ')
    phrase = phrase.replace('\\n', ' ')
    phrase = " ".join(filter(lambda x:x[0]!='@', phrase.split()))
    phrase = ' '.join(e for e in phrase.split() if e not in stopwords)
    phrase = re.sub('[^A-Za-z0-9]+', ' ', phrase)

    return phrase
```

In [9]:

```python
from tqdm import tqdm
preprocessed_sentiment = []
# tqdm is for printing the status bar
for sentance in tqdm(twitter_data['SentimentText'].values):
    sent = decontracted(sentance)
    sent = ' '.join(e for e in sent.split() if e not in stopwords)
    preprocessed_sentiment.append(sent.lower().strip())

```

```
100%|██████████| 1578612/1578612 [01:34<00:00, 16741.22it/s]
```

Remove the words whose size is <2 and >15 as they does not contain much information.

In [0]:

```python

twitter_data['processed_SentimentText']=preprocessed_sentiment

twitter_data['processed_SentimentText']= twitter_data['processed_Sentin
twitter_data['processed_SentimentText']= twitter_data['processed_Sentin
```

In [11]:

```
twitter_data
```

Out[11]:

	ItemID	Sentiment	SentimentSource	SentimentText	processed_SentimentText
0	1	0	Sentiment140	is so sad for my APL frie...	sad apl friend
1	2	0	Sentiment140	I missed the New Moon trail...	missed new moon trailer
2	3	1	Sentiment140	omg its already 7:30 :O	omg already
3	4	0	Sentiment140	.. Omgaga. Im sooo im gunna CRy. I'...	omgaga sooo gunna cry dentist since suposed ge...
4	5	0	Sentiment140	i think mi bf is cheating on me!!! ...	think cheating
5	6	0	Sentiment140	or i just worry too much?	worry much
6	7	1	Sentiment140	Juuuuuuuuuuuuuuuuussssst Chillin!!	chillin
7	8	0	Sentiment140	Sunny Again Work Tomorrow :-|	sunny again work tomorrow

In [12]:

```
print(twitter_data['SentimentText'].values[1578598])
print("="*50)
print(twitter_data['SentimentText'].values[1578508])
print("="*50)
print(twitter_data['SentimentText'].values[1578474])
print("="*50)
print(twitter_data['SentimentText'].values[1989])
print("="*50)
print(twitter_data['SentimentText'].values[1295])
print("="*50)
```

```
ZZ Top â€“ I Thank You ...@hawaiibuzz   .....Thanks for your music and for
your ear(s) ...ALL !!!! Have a fab... â™« http://blip.fm/~7qir4 (http://bl
ip.fm/~7qir4)
==================================================
YYYEEEEAAAAAHHHHHHHH, RED WINGS FTW!!!!! 5-0, BABY!!!!!
==================================================
yup its going to be @TaqiyyaLuvLa @10marion @officialTila @Tyrese4Real @Wi
llie_Day26 @souljaboytellem and many more tonight,fun...  lol jk
==================================================
 Im crushed, How could i have been so stupid?... ~!$@M@NTH@ !~
==================================================
 http://img207.imageshack.us/my.php?image=wpcl10670s.jpg (http://img207.im
ageshack.us/my.php?image=wpcl10670s.jpg) her songs are so perfect.
==================================================
```

In [13]:

```
print(twitter_data['processed_SentimentText'].values[1578598])
print("="*50)
print(twitter_data['processed_SentimentText'].values[1578508])
print("="*50)
print(twitter_data['processed_SentimentText'].values[1578474])
print("="*50)
print(twitter_data['processed_SentimentText'].values[1989])
print("="*50)
print(twitter_data['processed_SentimentText'].values[1295])
print("="*50)
```

```
top thank you thanks music ear all have fab http blipfm 7qir4
==================================================
red wings ftw baby
==================================================
yup going many tonight fun lol
==================================================
crushed how could stupid nth
==================================================
http myphp image wpcl10670sjpg songs perfect
==================================================
```

Data analysis and EDA

In [0]:

```
len(twitter_data['processed_SentimentText'])
```

Out[15]: 1578612

In [0]:

```
word_list=[]
for sentence in tqdm(range(len(twitter_data['processed_SentimentText'])
  l=twitter_data['processed_SentimentText'].values[sentence].split()
  for words in l:
    word_list.append(words)
```

```
100%|██████████| 1578612/1578612 [00:09<00:00, 170984.88it/s]
```

In [0]:

```
len(word_list)
```

Out[17]: 11351828

In [0]:

```
w=set(word_list)
```

In [0]:

```
len(w)
```

Out[19]: 425948

There are 11351828 words in total and 425948 are unique words.

Counting the frequency of each word

Ther are large no of words which requires large computation power so we can use 10000 words only

In [0]:

```
from tqdm import tqdm_notebook
D={}
for words in tqdm_notebook(w):
  c=0
  for i in word_list[:10000]:
    if(words==i):
      c=c+1
  D[words]=c

```

```
HBox(children=(IntProgress(value=0, max=425948), HTML(value='')))
```

you can see most word count is zero because we counted only 10000 words.

In [0]:

```
D
```

Out[21]:

```
{'dollyrocker': 0,
 'choppy': 0,
 'nxryqf': 0,
 'nyabwire': 0,
 'isort': 0,
 'snag': 0,
 'divention': 0,
 '6gaop': 0,
 'botar': 0,
 'latelydoing': 0,
 'searchbut': 0,
 'knowclowns': 0,
 'echooooo': 0,
 'sloss': 0,
 'wooha': 0,
 'gymbout': 0,
 'abowt': 0,
 'serveraufbau': 0,
 'talkim': 0,
 'hostility': 0
```

In [0]:

```
sorted_d = sorted(D.items(), key=lambda kv: kv[1],reverse=True)
```

In [0]:

```
sorted_d
```

Out[23]:

```
[('not', 234),
 ('http', 157),
 ('day', 89),
 ('get', 83),
 ('quot', 77),
 ('like', 60),
 ('got', 53),
 ('today', 51),
 ('amp', 50),
 ('good', 50),
 ('back', 48),
 ('going', 47),
 ('work', 47),
 ('one', 46),
 ('night', 46),
 ('want', 45),
 ('know', 41),
 ('love', 40),
 ('much', 37),
 ('think', 36),
```

These are the mostly occuring words in tweets

('not', 234)
('http', 157)
('day', 89)
('get', 83)
('quot', 77)
('like', 60)

Finding no of tweets in both negative and positive sentiments

In [0]:

```
neg_data=twitter_data.loc[twitter_data['Sentiment']==1]
```

In [0]:

```
neg_data
```

Out[25]:

	ItemID	Sentiment	SentimentSource	SentimentText	processed_SentimentText
2	3	1	Sentiment140	omg its already 7:30 :O	omg already
6	7	1	Sentiment140	Juuuuuuuuuuuuuuuuussssst Chillin!!	chillin
8	9	1	Sentiment140	handed in my uniform today . i miss you ...	handed uniform today miss already
9	10	1	Sentiment140	hmmmm.... i wonder how she my number @-)	hmmmm wonder number
11	12	1	Sentiment140	thanks to all the haters up in my face a...	thanks haters face day 112 102
17	18	1	Sentiment140	Feeling strangely fine. Now I'm gonna go l...	feeling strangely fine now gonna listen semiso...
				You're the only one who can	you one see cause one else

In [0]:

```
neg_data.describe()
```

Out[26]:

	ItemID	Sentiment
count	7.901770e+05	790177.0
mean	7.382949e+05	1.0
std	4.564029e+05	0.0
min	3.000000e+00	1.0
25%	3.393620e+05	1.0
50%	7.065250e+05	1.0
75%	1.135595e+06	1.0
max	1.578624e+06	1.0

In [0]:

```
pos_data=twitter_data.loc[twitter_data['Sentiment']==0]
```

In [0]:
```
pos_data
```

Out[28]:

	ItemID	Sentiment	SentimentSource	SentimentText	processed_SentimentText
0	1	0	Sentiment140	is so sad for my APL frie...	sad apl friend
1	2	0	Sentiment140	I missed the New Moon trail...	missed new moon trailer
3	4	0	Sentiment140	.. Omgaga. Im sooo im gunna CRy. I'...	omgaga sooo gunna cry dentist since suposed ge...
4	5	0	Sentiment140	i think mi bf is cheating on me!!! ...	think cheating
5	6	0	Sentiment140	or i just worry too much?	worry much
7	8	0	Sentiment140	Sunny Again Work Tomorrow :-| ...	sunny again work tomorrow tonight
10	11	0	Sentiment140	I must think about positive..	must think positive

In [0]:
```
pos_data.describe()
```

Out[29]:

	ItemID	Sentiment
count	7.884350e+05	788435.0
mean	8.404587e+05	0.0
std	4.492320e+05	0.0
min	1.000000e+00	0.0
25%	4.749300e+05	0.0
50%	8.682400e+05	0.0
75%	1.223862e+06	0.0
max	1.578627e+06	0.0

The data is Balanced

- No of negative sentiments : 790177
- No of positive sentiments : 788435

In [0]:
```
word_list=[]
for sentence in tqdm(range(len(neg_data['processed_SentimentText']))):
  l=neg_data['processed_SentimentText'].values[sentence].split()
  for words in l:
    word_list.append(words)

print("No of words in positive sentiments",len(word_list))
w=set(word_list)
print("No of unique words in positive sentiments",len(w))
```

```
100%|██████████| 790177/790177 [00:03<00:00, 204850.46it/s]

No of words in positive sentiments 5527914
No of unique words in positive sentiments 274418
```

In [0]:

```
from tqdm import tqdm_notebook
D_neg={}
for words in tqdm_notebook(w):
  c=0
  for i in word_list[:10000]:
    if(words==i):
      c=c+1
  D_neg[words]=c
```

```
HBox(children=(IntProgress(value=0, max=274418), HTML(value='')))
```

In [0]:

```
word_list=[]
for sentence in tqdm(range(len(pos_data['processed_SentimentText']))):
  l=pos_data['processed_SentimentText'].values[sentence].split()
  for words in l:
    word_list.append(words)

print("No of words in negative sentiments",len(word_list))
w=set(word_list)
print("No of unique words in negative sentiments",len(w))
```

```
100%|██████████| 788435/788435 [00:03<00:00, 197134.27it/s]

No of words in negative sentiments 5823914
No of unique words in negative sentiments 240894
```

In [0]:

```
from tqdm import tqdm_notebook
D_pos={}
for words in tqdm_notebook(w):
  c=0
  for i in word_list[:10000]:
    if(words==i):
      c=c+1
  D_pos[words]=c
```

```
HBox(children=(IntProgress(value=0, max=240894), HTML(value='')))
```

In [0]:

```
sorted_d_neg = sorted(D_neg.items(), key=lambda kv: kv[1],reverse=True)
sorted_d_pos = sorted(D_pos.items(), key=lambda kv: kv[1],reverse=True)
```

In [0]:

```
sorted_d_neg[:5]
```

Out[36]:

```
[('http', 175), ('not', 142), ('love', 111), ('good', 103), ('day', 89)]
```

In [0]:

```
sorted_d_pos[:5]
```

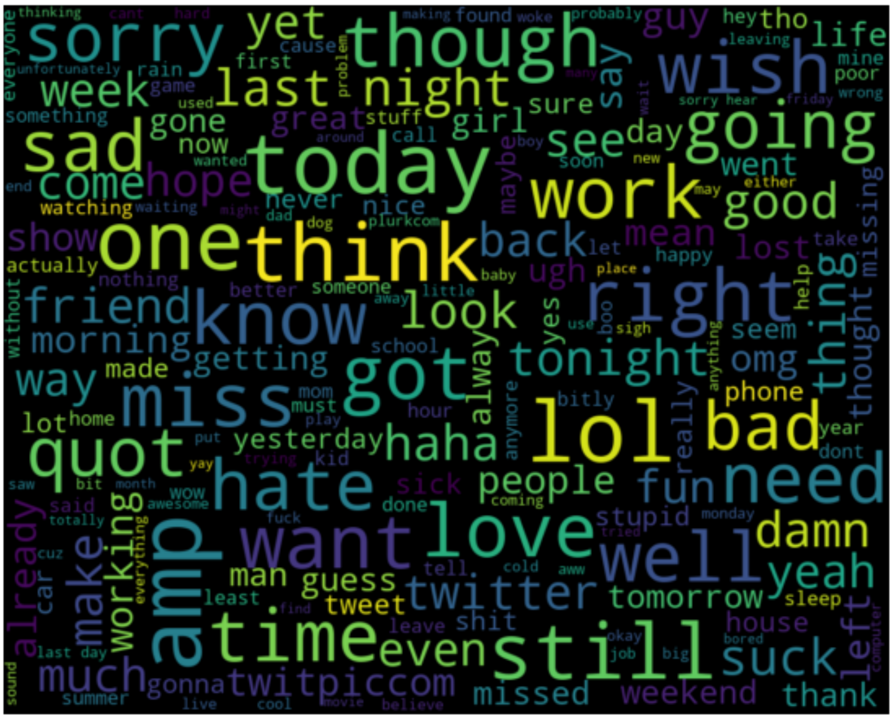
Out[37]:

```
[('not', 283), ('get', 95), ('http', 89), ('day', 73), ('want', 65)]
```

Word cloud for positive sentiments

In [0]:

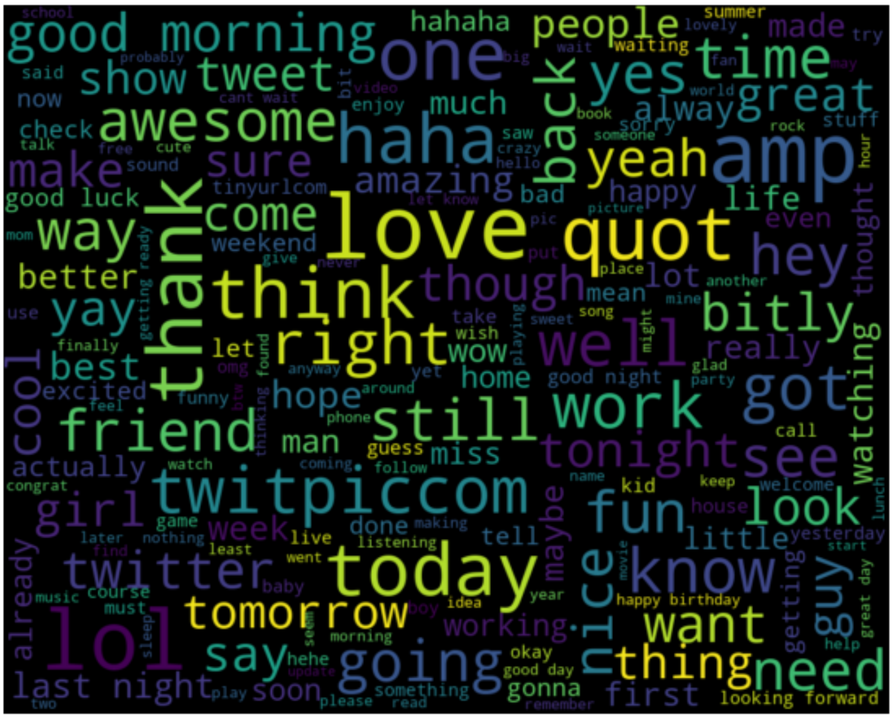
```
from wordcloud import WordCloud

st =' '.join([sentence for sentence in twitter_data['processed_Sentimen

wordcloud = WordCloud(width=1000, height=800, max_font_size=100).genera
plt.figure(figsize=(12, 8))
plt.imshow(wordcloud,interpolation="bilinear")
plt.axis('off')
plt.show()
```



Word cloud for Negative sentiments

In [0]:

```
st =' '.join([sentence for sentence in twitter_data['processed_Sentimen

wordcloud = WordCloud(width=1000, height=800, max_font_size=100).genera
plt.figure(figsize=(12, 8))
plt.imshow(wordcloud,interpolation="bilinear")
plt.axis('off')
plt.show()
```



1. From word cloud and other method we are not able to find words which distinguish between positive and negative sentiments

2. This thing is happening because for example if we say 'not good' and 'good' or 'not angry' or 'angry' because of one word our polarity changes and 'not' can be used as positively with 'angry' and negatively with 'good' so 'not' word can present in equal amount in both +ve and -ve sentiments.

In [14]:

```

import nltk
from nltk.sentiment.vader import SentimentIntensityAnalyzer

import nltk
nltk.download('vader_lexicon')

sid = SentimentIntensityAnalyzer()
negative=[]
neutral=[]
positive=[]
compound=[]
for i in tqdm(twitter_data['processed_SentimentText']):
    negative.append(sid.polarity_scores(i)['neg'])
    neutral.append(sid.polarity_scores(i)['neu'])
    positive.append(sid.polarity_scores(i)['pos'])
    compound.append(sid.polarity_scores(i)['compound'])
twitter_data['negative']=negative
twitter_data['neutral']=neutral
twitter_data['positive']=positive
twitter_data['compound']=compound


```

```
[nltk_data] Downloading package vader_lexicon to /root/nltk_data...

100%|██████████| 1578612/1578612 [11:13<00:00, 2344.02it/s]
```

In [15]:

```
twitter_data
```

Out[15]:

	ItemID	Sentiment	SentimentSource	SentimentText	processed_SentimentText	negat
0	1	0	Sentiment140	is so sad for my APL frie...	sad apl friend	0.4
1	2	0	Sentiment140	I missed the New Moon trail...	missed new moon trailer	0.4
2	3	1	Sentiment140	omg its already 7:30 :O	omg already	0.0
3	4	0	Sentiment140	.. Omgaga. Im sooo im gunna CRy. I'...	omgaga sooo gunna cry dentist since suposed ge...	0.2
4	5	0	Sentiment140	i think mi bf is cheating on me!!! ...	think cheating	0.7
5	6	0	Sentiment140	or i just worry too much?	worry much	0.7
6	7	1	Sentiment140	Juuuuuuuuuuuuuuuuussssst Chillin!!	chillin	0.0

Split the data into train and test

In [16]:

```
from sklearn.model_selection import train_test_split

# create design matrix X and target vector y
Xsp = (twitter_data.loc[:, twitter_data.columns != 'Sentiment']) # end
ysp = (twitter_data['Sentiment'] )
print(Xsp.shape)
# split the data set into train and test
X_1, X_test, y_1, y_test = train_test_split(Xsp, ysp, test_size=0.33, s

# split the train data set into cross validation train and cross valida
X_tr, X_cv, y_tr, y_cv = train_test_split(X_1, y_1, test_size=0.33, str
```

```
(1578612, 8)
```

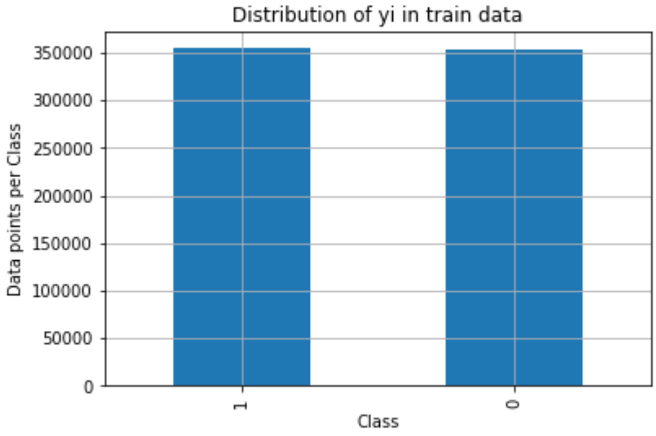
In [17]:

```
print(X_tr.shape, y_tr.shape)
print(X_cv.shape, y_cv.shape)
print(X_test.shape, y_test.shape)
```

```
(708638, 8) (708638,)
(349032, 8) (349032,)
(520942, 8) (520942,)
```

In [18]:

```
# it returns a dict, keys as class labels and values as the number of d
train_class_distribution = y_tr.value_counts()
test_class_distribution = y_test.value_counts()
cv_class_distribution = y_cv.value_counts()

my_colors = 'rgbkymc'
train_class_distribution.plot(kind='bar')
plt.xlabel('Class')
plt.ylabel('Data points per Class')
plt.title('Distribution of yi in train data')
plt.grid()
plt.show()

# ref: argsort https://docs.scipy.org/doc/numpy/reference/generated/num
# -(train_class_distribution.values): the minus sign will give us in de
sorted_yi = np.argsort(-train_class_distribution.values)
for i in sorted_yi:
    print('Number of data points in class', i+1, ':',train_class_distri


print('-'*80)
my_colors = 'rgbkymc'
test_class_distribution.plot(kind='bar')
plt.xlabel('Class')
plt.ylabel('Data points per Class')
plt.title('Distribution of yi in test data')
plt.grid()
plt.show()

# ref: argsort https://docs.scipy.org/doc/numpy/reference/generated/num
# -(train_class_distribution.values): the minus sign will give us in de
sorted_yi = np.argsort(-test_class_distribution.values)
for i in sorted_yi:
    print('Number of data points in class', i+1, ':',test_class_distrib

print('-'*80)
my_colors = 'rgbkymc'
cv_class_distribution.plot(kind='bar')
plt.xlabel('Class')
plt.ylabel('Data points per Class')
plt.title('Distribution of yi in cross validation data')
plt.grid()
plt.show()

# ref: argsort https://docs.scipy.org/doc/numpy/reference/generated/num
# -(train_class_distribution.values): the minus sign will give us in de
sorted_yi = np.argsort(-train_class_distribution.values)
for i in sorted_yi:
    print('Number of data points in class', i+1, ':',cv_class_distribut

```



Make Data Model Ready

Bag of words on processed_SentimentText

In [19]:

```
vectorizer = CountVectorizer(min_df=10)
Train_sentiment= vectorizer.fit_transform(X_tr['processed_SentimentText
CV_sentiment=vectorizer.transform(X_cv['processed_SentimentText'])
Test_sentiment=vectorizer.transform(X_test['processed_SentimentText'])
print(Train_sentiment.shape)
print(CV_sentiment.shape)
print(Test_sentiment.shape)
v5=vectorizer
#print(v5.get_feature_names())
```

```
(708638, 20966)
(349032, 20966)
(520942, 20966)
```

Tfidf on processed_SentimentText

In [18]:

```
from sklearn.feature_extraction.text import TfidfVectorizer

vectorizer = TfidfVectorizer(min_df=10)
Train_sentiment_tfidf = vectorizer.fit_transform(X_tr['processed_Sentim
CV_sentiment_tfidf = vectorizer.transform(X_cv['processed_SentimentText
Test_sentiment_tfidf = vectorizer.transform(X_test['processed_Sentiment
print(Train_sentiment_tfidf.shape)
print(CV_sentiment_tfidf.shape)
print(Test_sentiment_tfidf.shape)
vt5=vectorizer
```

```
(708638, 21009)
(349032, 21009)
(520942, 21009)
```

In [35]:

```
from sklearn.externals import joblib
joblib.dump(vt5, 'tfidf.pkl')
```

```
/usr/local/lib/python3.6/dist-packages/sklearn/externals/joblib/__init__.p
y:15: DeprecationWarning: sklearn.externals.joblib is deprecated in 0.21 a
nd will be removed in 0.23. Please import this functionality directly from
joblib, which can be installed with: pip install joblib. If this warning i
s raised when loading pickled models, you may need to re-serialize those m
odels with scikit-learn 0.21+.
  warnings.warn(msg, category=DeprecationWarning)
```

Out[35]:

```
['tfidf.pkl']
```

Word2Vec on processed_SentimentText

In [21]:

```
i=0
list_of_sentance=[]
for sentnc in tqdm(twitter_data['processed_SentimentText']):
    list_of_sentance.append(sentnc.split())
w2v_model=Word2Vec(list_of_sentance,min_count=5,size=30, workers=4)
w2v_words = list(w2v_model.wv.vocab)
print("number of words that occured minimum 5 times ",len(w2v_words))
print("sample words ", w2v_words[0:50])
```

```
100%|██████████| 1578612/1578612 [00:06<00:00, 231845.33it/s]

number of words that occured minimum 5 times  56009
sample words  ['sad', 'friend', 'missed', 'new', 'moon', 'trailer', 'omg',
'already', 'sooo', 'gunna', 'cry', 'dentist', 'since', 'suposed', 'get', '
crown', 'put', '30mins', 'think', 'cheating', 'worry', 'much', 'chillin',
'sunny', 'again', 'work', 'tomorrow', 'tonight', 'handed', 'uniform', 'tod
ay', 'miss', 'hmmmm', 'wonder', 'number', 'must', 'positive', 'thanks', 'h
aters', 'face', 'day', '112', '102', 'weekend', 'sucked', 'far', 'isnt', '
showing', 'australia', 'thats']
```

In [22]:

```
print(w2v_model.wv.most_similar('teacher'))
print('='*50)
print(w2v_model.wv.most_similar('student'))
```

```
[('teachers', 0.8473032116889954), ('spanish', 0.8191297054290771), ('spee
ch', 0.770124077796936), ('english', 0.7543643116950989), ('math', 0.74333
31608772278), ('german', 0.7421817779541016), ('lesson', 0.742073059082031
2), ('professor', 0.7399985790252686), ('science', 0.7337766885757446), ('
student', 0.7301725149154663)]
==================================================
[('students', 0.9109312295913696), ('education', 0.8706594705581665), ('un
iversity', 0.8394321203231812), ('courses', 0.8285565376281738), ('finance
', 0.8255401849746704), ('medical', 0.8147055506706238), ('phd', 0.7868836
522102356), ('financial', 0.7850071787834167), ('form', 0.778098165988922
1), ('banking', 0.7650643587112427)]
```

In [23]:

```
def avg_w2v_essays(text):
    avg_w2v_vectors = []; # the avg-w2v for each sentence/review is sto
    for sentence in tqdm(text): # for each review/sentence
        vector = np.zeros(30) # as word vectors are of zero length
        cnt_words =0; # num of words with a valid vector in the sentenc
        for word in sentence.split(): # for each word in a review/sente
            if word in w2v_model:
                vector += w2v_model.wv[word]
                cnt_words += 1
                cnt_words += 1
        if cnt_words != 0:
            vector /= cnt_words
        avg_w2v_vectors.append(vector)
    return(avg_w2v_vectors)
Train_Sentiment_w2v=avg_w2v_essays(X_tr['processed_SentimentText'])
CV_Sentiment_w2v=avg_w2v_essays(X_cv['processed_SentimentText'])
Test_Sentiment_w2v=avg_w2v_essays(X_test['processed_SentimentText'])
print(len(Train_Sentiment_w2v))
print(len(CV_Sentiment_w2v))
print(len(Test_Sentiment_w2v))
```

```
100%|██████████| 708638/708638 [00:41<00:00, 17101.99it/s]
100%|██████████| 349032/349032 [00:20<00:00, 16698.07it/s]
100%|██████████| 520942/520942 [00:30<00:00, 17060.22it/s]

708638
349032
520942
```

Tfidf weighted word2vec

In [24]:

```
def essay_tfidf_w2v(text,tfidf_model,dictionary,tfidf_words):

    tfidf_model.transform(text)

    tfidf_w2v_vectors = []; # the avg-w2v for each sentence/review is s
    for sentence in tqdm(text): # for each review/sentence
        vector = np.zeros(30) # as word vectors are of zero length
        tf_idf_weight =0; # num of words with a valid vector in the ser
        for word in sentence.split(): # for each word in a review/sente
            if (word in w2v_model) and (word in tfidf_words):
                vec = w2v_model.wv[word] # getting the vector for each
                # here we are multiplying idf value(dictionary[word]) a
                tf_idf = dictionary[word]*(sentence.count(word)/len(ser
                vector += (vec * tf_idf) # calculating tfidf weighted w
                tf_idf_weight += tf_idf
        if tf_idf_weight != 0:
            vector /= tf_idf_weight
        tfidf_w2v_vectors.append(vector)
    return(tfidf_w2v_vectors)
tfidf_model = TfidfVectorizer()
tfidf_model.fit(X_tr['processed_SentimentText'])
# we are converting a dictionary with word as a key, and the idf as a v

dictionary = dict(zip(tfidf_model.get_feature_names(), list(tfidf_model
tfidf_words = set(tfidf_model.get_feature_names())
Train_Sentiment_tfidf_w2v=essay_tfidf_w2v(X_tr['processed_SentimentText
CV_Sentiment_tfidf_w2v=essay_tfidf_w2v(X_cv['processed_SentimentText'],
Test_Sentiment_tfidf_w2v=essay_tfidf_w2v(X_test['processed_SentimentTex
print(len(Train_Sentiment_tfidf_w2v))
print(len(CV_Sentiment_tfidf_w2v))
print(len(Test_Sentiment_tfidf_w2v))
```

```
100%|██████████| 708638/708638 [01:11<00:00, 9875.18it/s]
100%|██████████| 349032/349032 [00:33<00:00, 10415.17it/s]
100%|██████████| 520942/520942 [00:54<00:00, 9569.87it/s]

708638
349032
520942
```

Positive Sentiments

In [19]:

```
from sklearn.preprocessing import Normalizer

norm = Normalizer()
Train_e_pos_word = norm.fit_transform(X_tr['positive'].values.reshape(-
CV_e_pos_word=norm.transform(X_cv['positive'].values.reshape(-1, 1))
Test_e_pos_word=norm.transform(X_test['positive'].values.reshape(-1, 1)
print('Training data shape',Train_e_pos_word.shape)
print('cv data shape',CV_e_pos_word.shape)
print('Test data shape',Test_e_pos_word.shape)
```

```
Training data shape (708638, 1)
cv data shape (349032, 1)
Test data shape (520942, 1)
```

Negative Sentiments

In [20]:

```python
norm = Normalizer()
Train_e_neg_word = norm.fit_transform(X_tr['negative'].values.reshape(-
CV_e_neg_word=norm.transform(X_cv['negative'].values.reshape(-1, 1))
Test_e_neg_word=norm.transform(X_test['negative'].values.reshape(-1, 1)
print('Training data shape',Train_e_neg_word.shape)
print('cv data shape',CV_e_neg_word.shape)
print('Test data shape',Test_e_neg_word.shape)
```

```
Training data shape (708638, 1)
cv data shape (349032, 1)
Test data shape (520942, 1)
```

Neutral Sentiments

In [21]:

```python
norm = Normalizer()
Train_e_neu_word = norm.fit_transform(X_tr['neutral'].values.reshape(-1
CV_e_neu_word=norm.transform(X_cv['neutral'].values.reshape(-1, 1))
Test_e_neu_word=norm.transform(X_test['neutral'].values.reshape(-1, 1))
print('Training data shape',Train_e_neu_word.shape)
print('cv data shape',CV_e_neu_word.shape)
print('Test data shape',Test_e_neu_word.shape)
```

```
Training data shape (708638, 1)
cv data shape (349032, 1)
Test data shape (520942, 1)
```

Compound sentiments

In [22]:

```python
norm = Normalizer()
Train_e_comp_word = norm.fit_transform(X_tr['compound'].values.reshape(
CV_e_comp_word=norm.transform(X_cv['compound'].values.reshape(-1, 1))
Test_e_comp_word=norm.transform(X_test['compound'].values.reshape(-1, 1
print('Training data shape',Train_e_comp_word.shape)
print('cv data shape',CV_e_comp_word.shape)
print('Test data shape',Test_e_comp_word.shape)
```

```
Training data shape (708638, 1)
cv data shape (349032, 1)
Test data shape (520942, 1)
```

In [0]:

```python
import matplotlib.pyplot as plt
from scipy.sparse import hstack
from sklearn.manifold import TSNE
from sklearn import datasets, neighbors
from matplotlib.colors import ListedColormap
from mlxtend.plotting import plot_decision_regions
```

Using only BOW

In [0]:

```python
def batch_predict(clf, data):
    # roc_auc_score(y_true, y_score) the 2nd parameter should be probab
    # not the predicted outputs

    y_data_pred = []
    tr_loop = data.shape[0] - data.shape[0]%1000
    # consider you X_tr shape is 49041, then your cr_loop will be 49041
    # in this for loop we will iterate unti the last 1000 multiplier
    for i in range(0, tr_loop, 1000):
        y_data_pred.extend(clf.predict_proba(data[i:i+1000])[:,1])
    # we will be predicting for the last data points
    y_data_pred.extend(clf.predict_proba(data[tr_loop:])[:,1])

    return y_data_pred
```

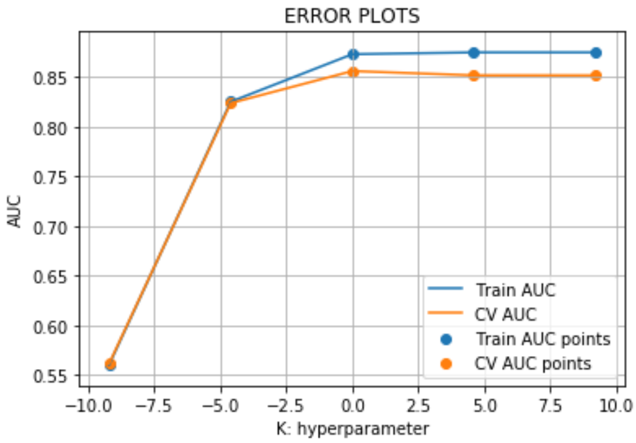
In [0]:

```
import math
from sklearn.linear_model import LogisticRegression
from sklearn import metrics
from sklearn.metrics import roc_curve, auc
from sklearn.metrics import roc_auc_score
```

In [33]:

```


train_auc = []
cv_auc = []
K = {'C': [10**-4, 10**-2, 10**0, 10**2, 10**4]}
for i in tqdm(K['C']):
    neigh = LogisticRegression(C=i,penalty='l1')
    neigh.fit(Train_sentiment, y_tr)

    y_train_pred = batch_predict(neigh, Train_sentiment)
    y_cv_pred = batch_predict(neigh, CV_sentiment)

    # roc_auc_score(y_true, y_score) the 2nd parameter should be probab
    # not the predicted outputs
    train_auc.append(roc_auc_score(y_tr,y_train_pred))
    cv_auc.append(roc_auc_score(y_cv, y_cv_pred))
log_K=[]
for l in K['C']:
    log_K.append(math.log(l))
plt.plot(log_K, train_auc, label='Train AUC')
plt.plot(log_K, cv_auc, label='CV AUC')

plt.scatter(log_K, train_auc, label='Train AUC points')
plt.scatter(log_K, cv_auc, label='CV AUC points')

plt.legend()
plt.xlabel("K: hyperparameter")
plt.ylabel("AUC")
plt.title("ERROR PLOTS")
plt.grid()
plt.show()
```

```
100%|██████████| 5/5 [00:23<00:00,  4.86s/it]
```

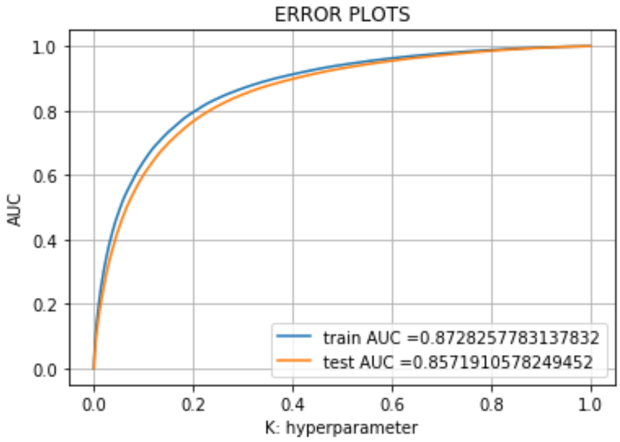


In [0]:

```
best_par1=1
```

In [36]:

```
from sklearn.metrics import roc_curve, auc

neigh = LogisticRegression(C=best_par1,penalty='l1')
neigh.fit(Train_sentiment, y_tr)
# roc_auc_score(y_true, y_score) the 2nd parameter should be probabilit
# not the predicted outputs

y_train_pred = batch_predict(neigh, Train_sentiment)
y_test_pred = batch_predict(neigh, Test_sentiment)

train_fpr, train_tpr, tr_thresholds = roc_curve(y_tr, y_train_pred)
test_fpr, test_tpr, te_thresholds = roc_curve(y_test, y_test_pred)

plt.plot(train_fpr, train_tpr, label="train AUC ="+str(auc(train_fpr, t
plt.plot(test_fpr, test_tpr, label="test AUC ="+str(auc(test_fpr, test_
plt.legend()
plt.xlabel("K: hyperparameter")
plt.ylabel("AUC")
plt.title("ERROR PLOTS")
plt.grid()
plt.show()
```



In [0]:

```
def predict(proba, threshould, fpr, tpr):

    t = threshould[np.argmax(tpr*(1-fpr))]

    # (tpr*(1-fpr)) will be maximum if your fpr is very low and tpr is

    print("the maximum value of tpr*(1-fpr)", max(tpr*(1-fpr)), "for th
    predictions = []
    for i in proba:
        if i>=t:
            predictions.append(1)
        else:
            predictions.append(0)
    return predictions
```

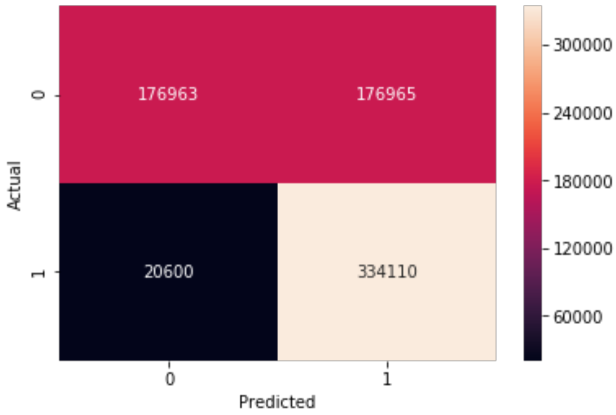
In [38]:

```
import seaborn as sns
print("Train confusion matrix")
sns.heatmap(confusion_matrix(y_tr, predict(y_train_pred, tr_thresholds,
plt.xlabel("Predicted")
plt.ylabel("Actual")
```

```
Train confusion matrix
the maximum value of tpr*(1-fpr) 0.2499999999920169 for threshold 0.242
```

Out[38]:

```
Text(33.0, 0.5, 'Actual')
```

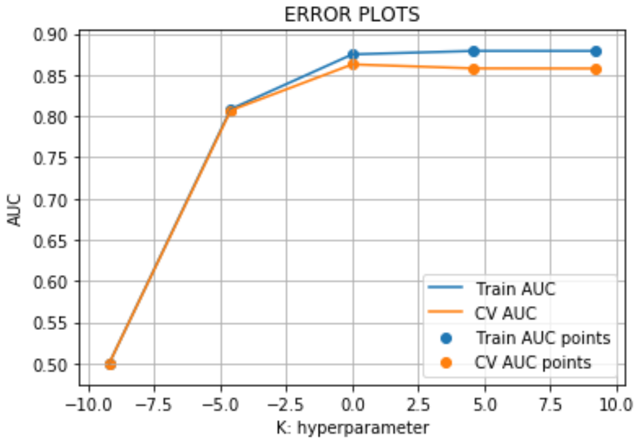


Using only Tfidf

In [39]:

```


train_auc = []
cv_auc = []
K = {'C': [10**-4, 10**-2, 10**0, 10**2, 10**4]}
for i in tqdm(K['C']):
    neigh = LogisticRegression(C=i,penalty='l1')
    neigh.fit(Train_sentiment_tfidf, y_tr)

    y_train_pred = batch_predict(neigh, Train_sentiment_tfidf)
    y_cv_pred = batch_predict(neigh, CV_sentiment_tfidf)

    # roc_auc_score(y_true, y_score) the 2nd parameter should be probab
    # not the predicted outputs
    train_auc.append(roc_auc_score(y_tr,y_train_pred))
    cv_auc.append(roc_auc_score(y_cv, y_cv_pred))
log_K=[]
for l in K['C']:
    log_K.append(math.log(l))
plt.plot(log_K, train_auc, label='Train AUC')
plt.plot(log_K, cv_auc, label='CV AUC')

plt.scatter(log_K, train_auc, label='Train AUC points')
plt.scatter(log_K, cv_auc, label='CV AUC points')

plt.legend()
plt.xlabel("K: hyperparameter")
plt.ylabel("AUC")
plt.title("ERROR PLOTS")
plt.grid()
plt.show()
```

```
100%|██████████| 5/5 [00:31<00:00,  6.78s/it]
```

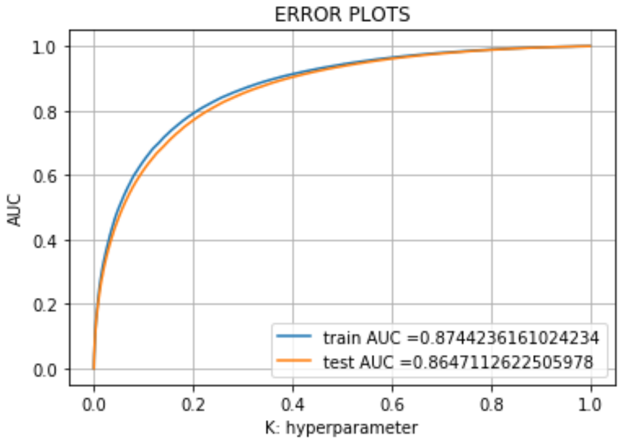


In [0]:

```
best_par1=1
```

In [39]:

```
from sklearn.metrics import roc_curve, auc

neigh = LogisticRegression(C=best_par1,penalty='l1')
neigh.fit(Train_sentiment_tfidf, y_tr)
# roc_auc_score(y_true, y_score) the 2nd parameter should be probabilit
# not the predicted outputs

y_train_pred = batch_predict(neigh, Train_sentiment_tfidf)
y_test_pred = batch_predict(neigh, Test_sentiment_tfidf)

train_fpr, train_tpr, tr_thresholds = roc_curve(y_tr, y_train_pred)
test_fpr, test_tpr, te_thresholds = roc_curve(y_test, y_test_pred)

plt.plot(train_fpr, train_tpr, label="train AUC ="+str(auc(train_fpr, t
plt.plot(test_fpr, test_tpr, label="test AUC ="+str(auc(test_fpr, test_
plt.legend()
plt.xlabel("K: hyperparameter")
plt.ylabel("AUC")
plt.title("ERROR PLOTS")
plt.grid()
plt.show()
```



In [40]:

```
joblib.dump(neigh, 'tflr.pkl')
```

Out[40]:

```
['tflr.pkl']
```

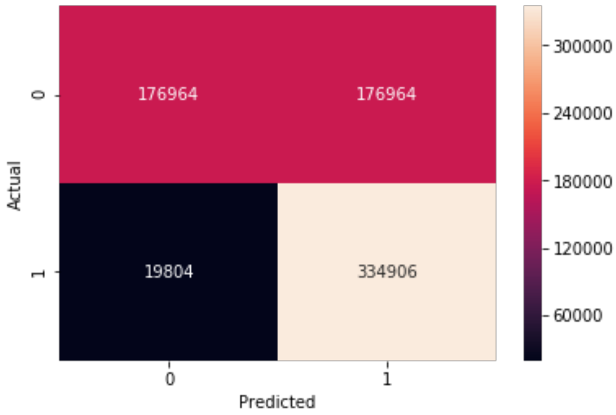
In [42]:

```
import seaborn as sns
print("Train confusion matrix")
sns.heatmap(confusion_matrix(y_tr, predict(y_train_pred, tr_thresholds,
plt.xlabel("Predicted")
plt.ylabel("Actual")
```

```
Train confusion matrix
the maximum value of tpr*(1-fpr) 0.25 for threshold 0.237
```

Out[42]:

```
Text(33.0, 0.5, 'Actual')
```

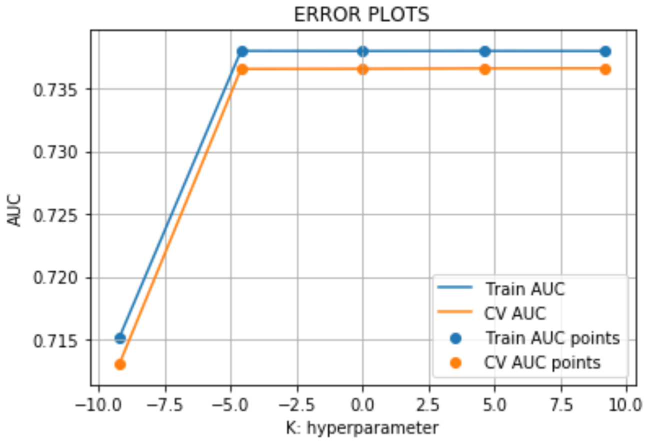


Using word2vec

In [46]:

```

train_auc = []
cv_auc = []
K = {'C': [10**-4, 10**-2, 10**0, 10**2, 10**4]}
for i in tqdm(K['C']):
    neigh = LogisticRegression(C=i,penalty='l1')
    neigh.fit(Train_Sentiment_w2v, y_tr)

    y_train_pred = neigh.predict(Train_Sentiment_w2v)
    y_cv_pred = neigh.predict(CV_Sentiment_w2v)

    # roc_auc_score(y_true, y_score) the 2nd parameter should be probab
    # not the predicted outputs
    train_auc.append(roc_auc_score(y_tr,y_train_pred))
    cv_auc.append(roc_auc_score(y_cv, y_cv_pred))
log_K=[]
for l in K['C']:
    log_K.append(math.log(l))
plt.plot(log_K, train_auc, label='Train AUC')
plt.plot(log_K, cv_auc, label='CV AUC')

plt.scatter(log_K, train_auc, label='Train AUC points')
plt.scatter(log_K, cv_auc, label='CV AUC points')

plt.legend()
plt.xlabel("K: hyperparameter")
plt.ylabel("AUC")
plt.title("ERROR PLOTS")
plt.grid()
plt.show()
```

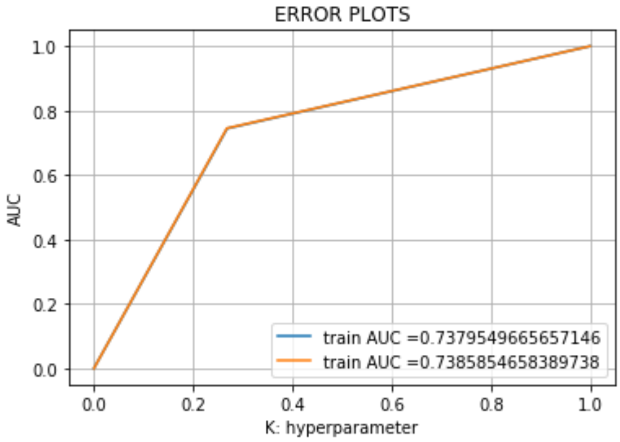
```
100%|██████████| 5/5 [03:00<00:00, 35.07s/it]
```



In [0]:

```
best_par1=0.01
```

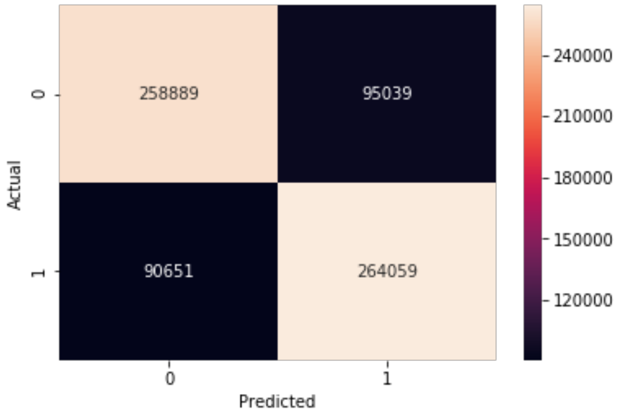
In [50]:
```
from sklearn.metrics import roc_curve, auc

neigh = LogisticRegression(C=best_par1,penalty='l1',class_weight='balar
neigh.fit(Train_Sentiment_w2v, y_tr)
# roc_auc_score(y_true, y_score) the 2nd parameter should be probabilit
# not the predicted outputs

y_train_pred = neigh.predict(Train_Sentiment_w2v)
y_test_pred = neigh.predict(Test_Sentiment_w2v)

train_fpr, train_tpr, tr_thresholds = roc_curve(y_tr, y_train_pred)
test_fpr, test_tpr, te_thresholds = roc_curve(y_test, y_test_pred)

plt.plot(train_fpr, train_tpr, label="train AUC ="+str(auc(train_fpr, t
plt.plot(test_fpr, test_tpr, label="test AUC ="+str(auc(test_fpr, test_
plt.legend()
plt.xlabel("K: hyperparameter")
plt.ylabel("AUC")
plt.title("ERROR PLOTS")
plt.grid()
plt.show()
```



In [51]:
```
import seaborn as sns
print("Train confusion matrix")
sns.heatmap(confusion_matrix(y_tr, predict(y_train_pred, tr_thresholds,
plt.xlabel("Predicted")
plt.ylabel("Actual")
```

```
Train confusion matrix
the maximum value of tpr*(1-fpr) 0.19641995720017538 for threshold 1
```

Out[51]:
```
Text(33.0, 0.5, 'Actual')
```

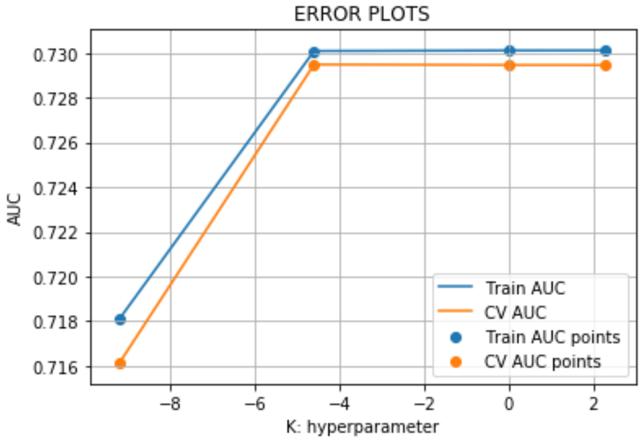


Using tfidf weighted w2v

In [56]:

```python

train_auc = []
cv_auc = []
K = {'C': [10**-4, 10**-2, 10**0, 10**1]}
for i in tqdm(K['C']):
    neigh = LogisticRegression(C=i,penalty='l1')
    neigh.fit(Train_Sentiment_tfidf_w2v, y_tr)

    y_train_pred = neigh.predict(Train_Sentiment_tfidf_w2v)
    y_cv_pred = neigh.predict(CV_Sentiment_tfidf_w2v)

    # roc_auc_score(y_true, y_score) the 2nd parameter should be probab
    # not the predicted outputs
    train_auc.append(roc_auc_score(y_tr,y_train_pred))
    cv_auc.append(roc_auc_score(y_cv, y_cv_pred))
log_K=[]
for l in K['C']:
    log_K.append(math.log(l))
plt.plot(log_K, train_auc, label='Train AUC')
plt.plot(log_K, cv_auc, label='CV AUC')

plt.scatter(log_K, train_auc, label='Train AUC points')
plt.scatter(log_K, cv_auc, label='CV AUC points')

plt.legend()
plt.xlabel("K: hyperparameter")
plt.ylabel("AUC")
plt.title("ERROR PLOTS")
plt.grid()
plt.show()
```

```
100%|██████████| 4/4 [01:38<00:00, 21.68s/it]
```

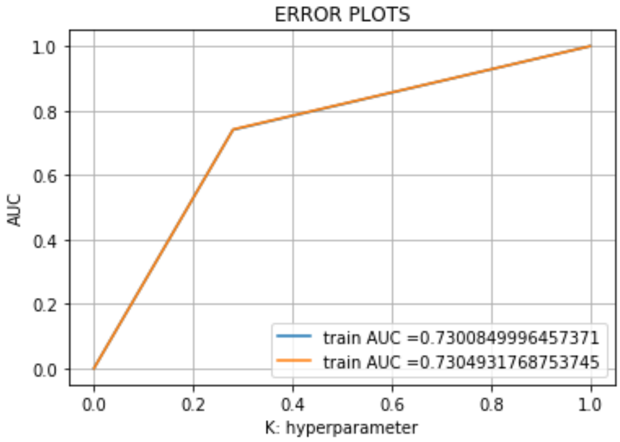


In [0]:

```python
best_par1=0.01
```

In [57]:

```
from sklearn.metrics import roc_curve, auc

neigh = LogisticRegression(C=best_par1,penalty='l1')
neigh.fit(Train_Sentiment_tfidf_w2v, y_tr)
# roc_auc_score(y_true, y_score) the 2nd parameter should be probabilit
# not the predicted outputs

y_train_pred = neigh.predict( Train_Sentiment_tfidf_w2v)
y_test_pred = neigh.predict(Test_Sentiment_tfidf_w2v)

train_fpr, train_tpr, tr_thresholds = roc_curve(y_tr, y_train_pred)
test_fpr, test_tpr, te_thresholds = roc_curve(y_test, y_test_pred)

plt.plot(train_fpr, train_tpr, label="train AUC ="+str(auc(train_fpr, t
plt.plot(test_fpr, test_tpr, label="train AUC ="+str(auc(test_fpr, test
plt.legend()
plt.xlabel("K: hyperparameter")
plt.ylabel("AUC")
plt.title("ERROR PLOTS")
plt.grid()
plt.show()
```



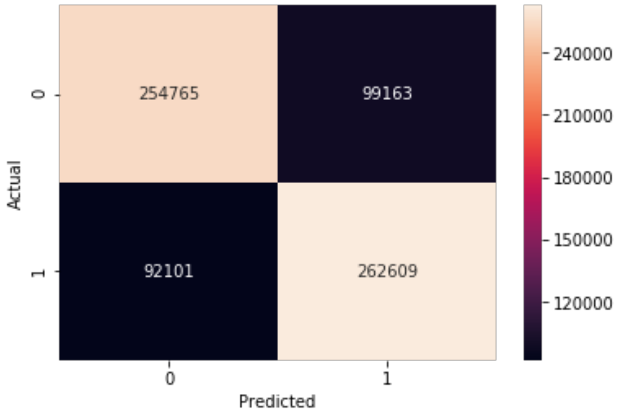
In [59]:

```
import seaborn as sns
print("Train confusion matrix")
sns.heatmap(confusion_matrix(y_tr, predict(y_train_pred, tr_thresholds,
plt.xlabel("Predicted")
plt.ylabel("Actual")
```

```
Train confusion matrix
the maximum value of tpr*(1-fpr) 0.20167848807899258 for threshold 1
```

Out[59]:

```
Text(33.0, 0.5, 'Actual')
```



From all the above models LR perform good in Tfidf.

Using tfidf with sentiments

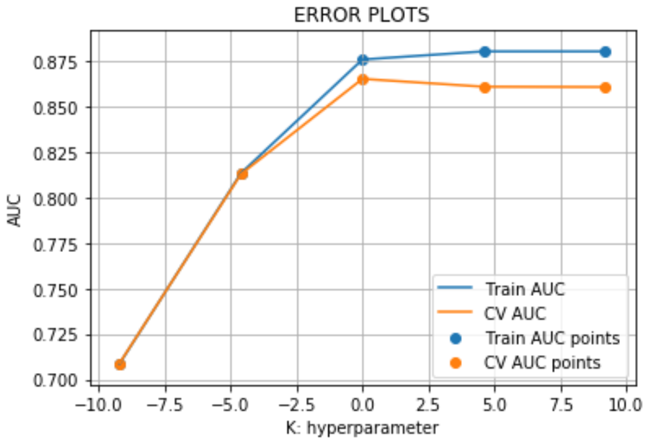
In [0]:

```
Xh5 = hstack((Train_sentiment_tfidf,Train_e_pos_word,Train_e_neg_word,T

Xh5_test=hstack((Test_sentiment_tfidf,Test_e_pos_word,Test_e_neg_word,T

Xh5_cross=hstack((CV_sentiment_tfidf,CV_e_pos_word,CV_e_neg_word,CV_e_r
```

In [28]:

```


train_auc = []
cv_auc = []
K = {'C': [10**-4, 10**-2, 10**0, 10**2, 10**4]}
for i in tqdm(K['C']):
    neigh = LogisticRegression(C=i,penalty='l1')
    neigh.fit(Xh5, y_tr)

    y_train_pred = batch_predict(neigh, Xh5)
    y_cv_pred = batch_predict(neigh, Xh5_cross)

    # roc_auc_score(y_true, y_score) the 2nd parameter should be probab
    # not the predicted outputs
    train_auc.append(roc_auc_score(y_tr,y_train_pred))
    cv_auc.append(roc_auc_score(y_cv, y_cv_pred))
log_K=[]
for l in K['C']:
    log_K.append(math.log(l))
plt.plot(log_K, train_auc, label='Train AUC')
plt.plot(log_K, cv_auc, label='CV AUC')

plt.scatter(log_K, train_auc, label='Train AUC points')
plt.scatter(log_K, cv_auc, label='CV AUC points')

plt.legend()
plt.xlabel("K: hyperparameter")
plt.ylabel("AUC")
plt.title("ERROR PLOTS")
plt.grid()
plt.show()
```

```
100%|██████████| 5/5 [02:59<00:00, 37.14s/it]
```

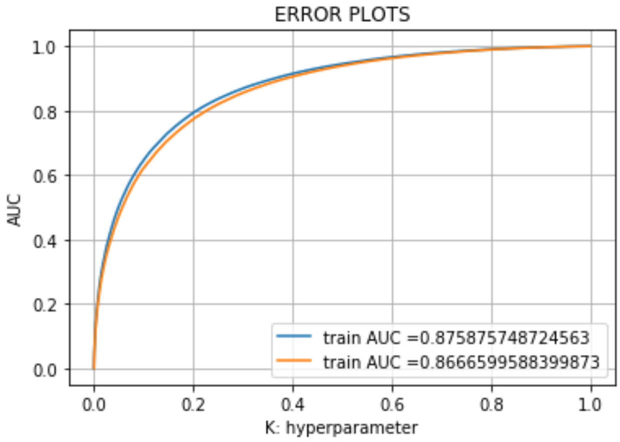


In [0]:

```
best_par1=1
```

In [30]:

```
from sklearn.metrics import roc_curve, auc

neigh = LogisticRegression(C=best_par1,penalty='l1',class_weight='balar
neigh.fit(Xh5, y_tr)
# roc_auc_score(y_true, y_score) the 2nd parameter should be probabilit
# not the predicted outputs

y_train_pred = batch_predict(neigh, Xh5)
y_test_pred = batch_predict(neigh, Xh5_test)

train_fpr, train_tpr, tr_thresholds = roc_curve(y_tr, y_train_pred)
test_fpr, test_tpr, te_thresholds = roc_curve(y_test, y_test_pred)

plt.plot(train_fpr, train_tpr, label="train AUC ="+str(auc(train_fpr, t
plt.plot(test_fpr, test_tpr, label="train AUC ="+str(auc(test_fpr, test
plt.legend()
plt.xlabel("K: hyperparameter")
plt.ylabel("AUC")
plt.title("ERROR PLOTS")
plt.grid()
plt.show()
```



In [37]:

```
import pickle
joblib.dump(neigh, 'lr.pkl')
```

Out[37]:

```
['lr.pkl']
```

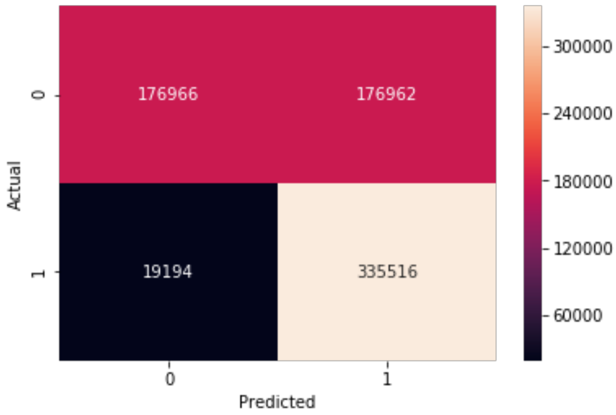
In [0]:

```
import seaborn as sns
print("Train confusion matrix")
sns.heatmap(confusion_matrix(y_tr, predict(y_train_pred, tr_thresholds,
plt.xlabel("Predicted")
plt.ylabel("Actual")
```

```
Train confusion matrix
the maximum value of tpr*(1-fpr) 0.24999999996806768 for threshold 0.228
```

Out[64]:

```
Text(33.0, 0.5, 'Actual')
```



In [88]:

```
from prettytable import PrettyTable

x = PrettyTable()

x.field_names = ["Model","Vectorizer", "Hyper parameter", "Train AUC",'

x.add_row(["Logistic Regression","BOW", "C=1",0.87282,85719 ])
x.add_row(["Logistic Regression","TFIDF", "C=1",0.87501,0.86423 ])
x.add_row(["Logistic Regression","W2V", "C=0.01",0.73759,0.73758 ])
x.add_row(["Logistic Regression","TFIDF W2V", "C=0.01",0.73008,0.73049
x.add_row(["Logistic Regression","TFIDF W2V + sentiments", "C=1",0.8765

print(x)
```

```
+---------------------+------------------------+-----------------+--------
---+----------+
|        Model        |       Vectorizer       | Hyper parameter | Train A
UC | Test AUC |
+---------------------+------------------------+-----------------+--------
---+----------+
| Logistic Regression |          BOW           |       C=1       |  0.8728
2  |  85719   |
| Logistic Regression |         TFIDF          |       C=1       |  0.8750
1  | 0.86423  |
| Logistic Regression |          W2V           |      C=0.01     |  0.7375
9  | 0.73758  |
| Logistic Regression |       TFIDF W2V        |      C=0.01     |  0.7300
8  | 0.73049  |
| Logistic Regression | TFIDF W2V + sentiments |       C=1       |  0.8765
8  | 0.86604  |
+---------------------+------------------------+-----------------+--------
---+----------+
```

Conclusion

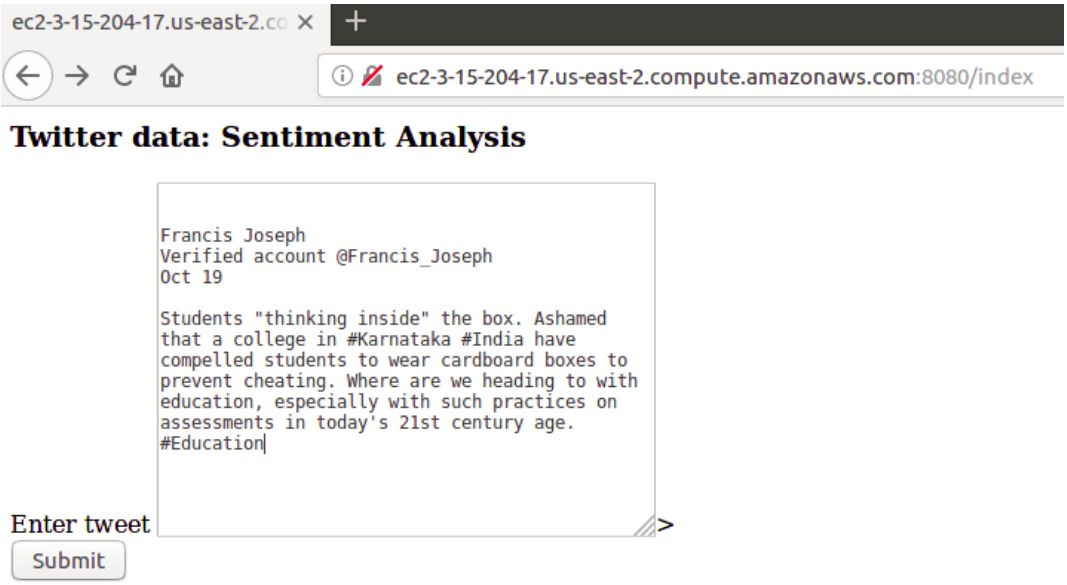
- We have applied the logistic regression on various vectorizer and observed that Tfidf with sentiments is giving the best results

Steps for model

- Download the twitter dataset.
- Preprocessed the data.
- Perform EDA and data analysis.
- Prepare data for model by featurization.
- Use Logistic regression on features obtained.
- Check AUC for various model and give the best model.

Output of model

Negative review

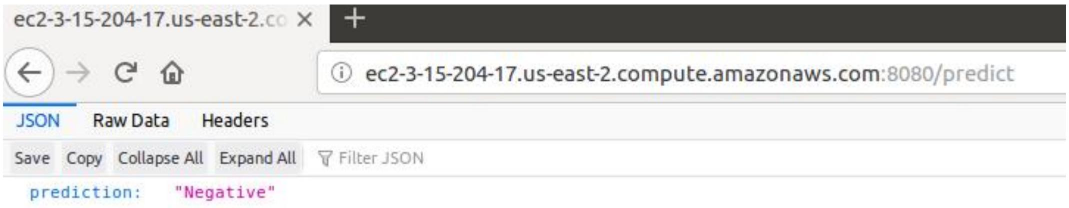

ec2-3-15-204-17.us-east-2.co
ec2-3-15-204-17.us-east-2.compute.amazonaws.com:8080/index

Twitter data: Sentiment Analysis

```
Francis Joseph
Verified account @Francis_Joseph
Oct 19

Students "thinking inside" the box. Ashamed
that a college in #Karnataka #India have
compelled students to wear cardboard boxes to
prevent cheating. Where are we heading to with
education, especially with such practices on
assessments in today's 21st century age.
#Education
```

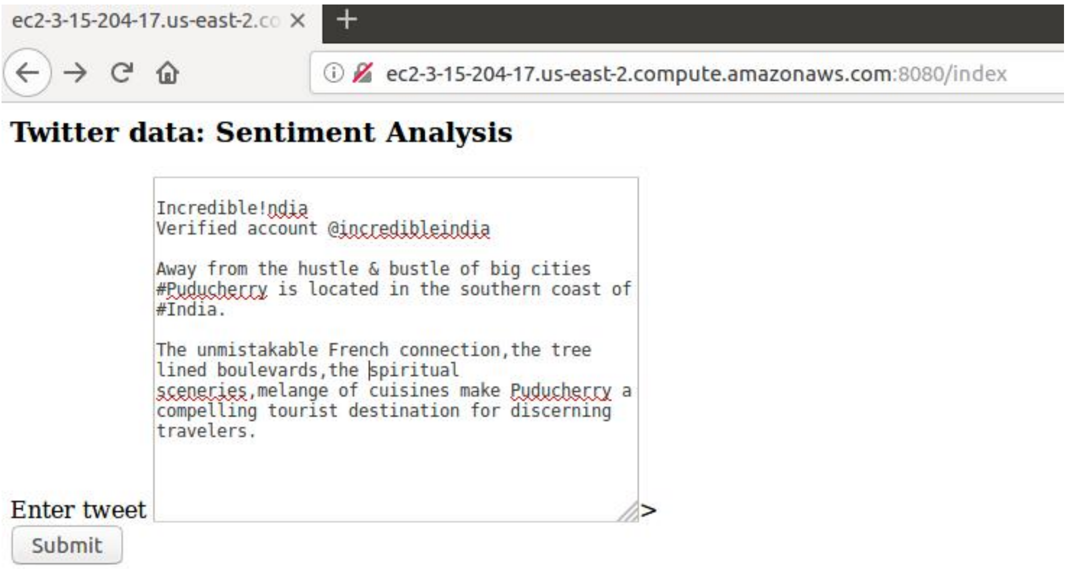
Enter tweet >

Submit


ec2-3-15-204-17.us-east-2.co
ec2-3-15-204-17.us-east-2.compute.amazonaws.com:8080/predict
JSON
Raw Data
Headers
Save
Copy
Collapse All
Expand All
Filter JSON

```
prediction:   "Negative"
```

Positive review


ec2-3-15-204-17.us-east-2.co
ec2-3-15-204-17.us-east-2.compute.amazonaws.com:8080/index

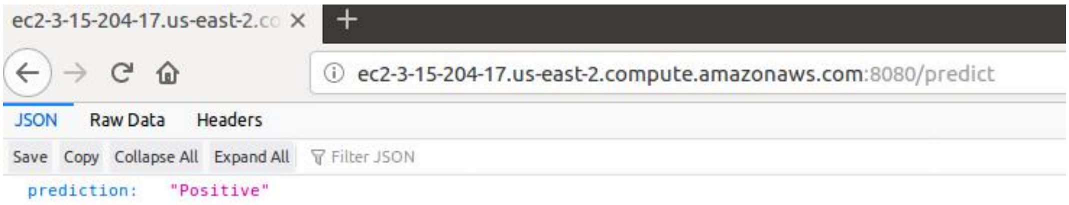
Twitter data: Sentiment Analysis

Enter tweet

```
Incredible!ndia
Verified account @incredibleindia

Away from the hustle & bustle of big cities
#Puducherry is located in the southern coast of
#India.

The unmistakable French connection,the tree
lined boulevards,the spiritual
sceneries,melange of cuisines make Puducherry a
compelling tourist destination for discerning
travelers.
```

>

Submit


ec2-3-15-204-17.us-east-2.co
ec2-3-15-204-17.us-east-2.compute.amazonaws.com:8080/predict
JSON
Raw Data
Headers
Save
Copy
Collapse All
Expand All
Filter JSON

```
prediction:    "Positive"
```

Play with model here

[http://ec2-3-15-204-17.us-east-2.compute.amazonaws.com:8080/index (http://ec2-3-15-204-17.us-east-2.compute.amazonaws.com:8080/index)](http://ec2-3-15-204-17.us-east-2.compute.amazonaws.com:8080/index)

you can mail me at ankuyadav17@gmail.com (mailto:ankuyadav17@gmail.com) if the link doesn't work as i have to start the EC2 instance from the local machine.

```
In [ ]:
```