In [1]:
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
from matplotlib import style
import seaborn as sns
#configure
# sets matplotlib to inline and displays graphs below the corressponding
cell.
%matplotlib inline
style.use('fivethirtyeight')
sns.set(style='whitegrid',color_codes=True)

#nltk
import nltk

#preprocessing
from nltk.corpus import stopwords  #stopwords
from nltk import word_tokenize,sent_tokenize # tokenizing
from nltk.stem import PorterStemmer,LancasterStemmer  # using the Porter
Stemmer and Lancaster Stemmer and others
from nltk.stem.snowball import SnowballStemmer
from nltk.stem import WordNetLemmatizer  # lammatizer from WordNet

# for part-of-speech tagging
from nltk import pos_tag

# for named entity recognition (NER)
from nltk import ne_chunk

# vectorizers for creating the document-term-matrix (DTM)
from sklearn.feature_extraction.text import TfidfVectorizer,CountVectori
zer

# BeautifulSoup libraray
#from bs4 import BeautifulSoup

import re # regex

#model_selection
from sklearn.model_selection import train_test_split,cross_validate
from sklearn.model_selection import KFold
from sklearn.model_selection import GridSearchCV

#evaluation
from sklearn.metrics import accuracy_score,roc_auc_score
from sklearn.metrics import classification_report
#from mlxtend.plotting import plot_confusion_matrix

#preprocessing scikit
from sklearn.preprocessing import MinMaxScaler,StandardScaler,Imputer,La
belEncoder

#classifiaction.
from sklearn.linear_model import LogisticRegression
from sklearn.svm import LinearSVC,SVC
from sklearn.neighbors import KNeighborsClassifier
```

```
from sklearn.ensemble import RandomForestClassifier,GradientBoostingClas
sifier,AdaBoostClassifier
from sklearn.tree import DecisionTreeClassifier
from sklearn.naive_bayes import GaussianNB,MultinomialNB

#stop-words
stop_words=set(nltk.corpus.stopwords.words('english'))

#keras
import keras
from keras.preprocessing.text import one_hot,Tokenizer
from keras.preprocessing.sequence import pad_sequences
from keras.models import Sequential
from keras.layers import Dense , Flatten ,Embedding,Input,CuDNNLSTM,LSTM
from keras.models import Model
from keras.preprocessing.text import text_to_word_sequence

#gensim w2v
#word2vec
from gensim.models import Word2Vec
#import nltk
#nltk.download('punkt')
import nltk.data
```

```
Using TensorFlow backend.
```

In [2]:
```
data=pd.read_csv(r'/Users/shubhamkumar/Downloads/train.csv')
```

In [112]:
```
data.head()
```

Out[112]:

	id	App Version Code	App Version Name	Review Text	Review Title	Star Rating
0	b817b0f0-a2f8-4c9d-a5f6-d3fbf8b1d7e9	NaN	NaN	Very bad wallet balance not use.	NaN	1
1	c7844e8f-56c1-487b-ae3e-df2fdf4c1767	43.0	2.30	Froud app i recharge 199 but not done also sen...	NaN	1
2	93ff57f7-9e02-4fa9-b779-3db82b8af0a4	52.0	2.12	Waste to write comments also	Waste no use	2
3	df2dcdef-c09a-4f35-afab-e1231d3fec9a	62.0	2.21	Nice apo	NaN	5
4	11f8f968-4cec-4424-8427-9709ab05b5be	69.0	2.28	Good nice app	NaN	5

In [5]:
```
data_copy=data.copy()
data_copy.head()
data_copy=data_copy.drop(['id', 'App Version Code','App Version Name','R
eview Title'], axis=1)
```

In [111]:
```
data_copy=data_copy.dropna()
data_copy.head()
```

Out[111]:

	Review Text	Star Rating	clean_review
0	Very bad wallet balance not use.	1	bad wallet balance use
1	Froud app i recharge 199 but not done also sen...	1	froud app recharge done also send mail niki ev...
2	Waste to write comments also	2	waste write comment also
3	Nice apo	5	nice apo
4	Good nice app	5	good nice app

In [7]:
```
print(data_copy['Star Rating'].isnull().sum())
data_copy['Review Text'].isnull().sum()
#data_copy.dropna
```

```
0
```

Out[7]: 0

In [110]:
```
data_copy.drop_duplicates(subset=['Star Rating','Review Text'],keep='first',inplace=True)
data_copy.head()
```

Out[110]:

	Review Text	Star Rating	clean_review
0	Very bad wallet balance not use.	1	bad wallet balance use
1	Froud app i recharge 199 but not done also sen...	1	froud app recharge done also send mail niki ev...
2	Waste to write comments also	2	waste write comment also
3	Nice apo	5	nice apo
4	Good nice app	5	good nice app

In [9]:
```
data_copy.shape
```

Out[9]: (4659, 2)

In [10]:
```
for review in data_copy['Review Text'][:10]:
    print(review+'\n'+'\n')
```

```
Very bad wallet balance not use.


Froud app i recharge 199 but not done also send mail to niki even not r
eplied


Waste to write comments also


Nice apo


Good nice app


Ghatiya app. Bill fetch nhi hota ..


They showed recharge successful but I didn't got


This is good app for recharge and electric bill payment


Worst app i never had seen before


Good
```

In [11]:
```
data_copy.head()
```

Out[11]:

	Review Text	Star Rating
0	Very bad wallet balance not use.	1
1	Froud app i recharge 199 but not done also sen...	1
2	Waste to write comments also	2
3	Nice apo	5
4	Good nice app	5

In [12]:
```
def clean_reviews(review):
    review_text = re.sub("[^a-zA-Z]"," ",review)
    word_tokens= review_text.lower().split()
    le=WordNetLemmatizer()
    stop_words= set(stopwords.words("english"))
    word_tokens= [le.lemmatize(w) for w in word_tokens if not w in stop_
words]

    cleaned_review=" ".join(word_tokens)
    return cleaned_review
```

In [61]:
```

```

Out[61]: 5

In [62]:
```

```

Out[62]: 5

In [ ]:
```
import nltk
import ssl

try:
    _create_unverified_https_context = ssl._create_unverified_context
except AttributeError:
    pass
else:
    ssl._create_default_https_context = _create_unverified_https_context

nltk.download()
```

```
showing info https://raw.githubusercontent.com/nltk/nltk_data/gh-pages/
index.xml
```

In [13]:
```
tokenizer = nltk.data.load('tokenizers/punkt/english.pickle')
sentences=[]
sum=0
for reviews in data_copy['Review Text']:
  #reviews=reviews.strip()
  sents=tokenizer.tokenize(reviews)
  sum+=len(sents)
  for sent in sents:
    cleaned_sent=clean_reviews(sent)
    sentences.append(cleaned_sent.split())
print(sum)
print(len(sentences))
```

```
7493
7493
```

In [15]:
```

```

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

Out[14]:

	Review Text	Star Rating
0	Very bad wallet balance not use.	1
1	Froud app i recharge 199 but not done also sen...	1
2	Waste to write comments also	2
3	Nice apo	5
4	Good nice app	5

In [86]:
```

```

In [15]:
```

```

```
7493
7493
```

In [16]:
```
data_copy['Review Text'].head()
```

Out[16]:
```
0                      Very bad wallet balance not use.
1    Froud app i recharge 199 but not done also sen...
2                          Waste to write comments also
3                                              Nice apo
4                                         Good nice app
Name: Review Text, dtype: object
```

In [17]:
```
for te in sentences[:5]:
  print(te,"\n")
```

```
['bad', 'wallet', 'balance', 'use']

['froud', 'app', 'recharge', 'done', 'also', 'send', 'mail', 'niki', 'e
ven', 'replied']

['waste', 'write', 'comment', 'also']

['nice', 'apo']

['good', 'nice', 'app']
```

In [18]:
```
import gensim
word_to_vector=gensim.models.Word2Vec(sentences=sentences,size=300,windo
w=10,min_count=1)
```

In [18]:
```
word_to_vector
```

Out[18]:
```
<gensim.models.word2vec.Word2Vec at 0x124855898>
```

In [19]:
```
word_to_vector.train(sentences,epochs=10,total_examples=len(sentences))
```

Out[19]:
```
(331585, 422400)
```

In [22]:
```
word_to_vector.wv.get_vector('like')
```

Out[22]:
```
array([ 0.31035715,  0.07410525, -0.164341  , -0.0310457 ,  0.37954938,
        0.38729993,  0.18264441,  0.31271455, -0.5999716 ,  0.37175754,
        0.37046286, -0.05836467,  0.29443774, -0.27995864, -0.03272411,
       -0.09805772, -0.20410037,  0.00300023,  0.59462506, -0.24453902,
        0.08107594,  0.25447246, -0.34302855, -0.17618503,  0.26905206,
       -0.5208819 ,  0.33707663, -0.1408282 , -0.5136242 ,  0.11994869,
       -0.08521628, -0.6036027 ,  0.07495014, -0.10840982, -0.10478064,
        0.49304768, -0.22123945, -0.08518068,  0.38485113,  0.21789922,
       -0.0078093 , -0.34087464, -0.37575412, -0.1337511 , -0.45145297,
       -0.31914005,  0.20104848, -0.18450761,  0.15920153,  0.05297628,
       -0.04989929,  0.48027432, -0.10310697, -0.3494929 ,  0.16990039,
        0.12888421,  0.15953958, -0.04719093, -0.00103885,  0.28209177,
       -0.05891646, -0.40323663,  0.07447197,  0.08400062,  0.38244295,
        0.17458363,  0.14535551,  0.5120383 ,  0.16683532, -0.44442546,
        0.47036907,  0.22249517, -0.19431773,  0.17915714, -0.15380202,
        0.22271568,  0.05381175, -0.47559074, -0.48514655,  0.06873784,
       -0.23283462, -0.16426289,  0.21475357,  0.26019624,  0.55405885,
       -0.19801933, -0.2523942 , -0.34400716,  0.15026788,  0.11970795,
       -0.18521188,  0.16270867, -0.3362699 , -0.20860754, -0.04753001,
       -0.05562485, -0.22402744, -0.09372253, -0.2753858 ,  0.5757594 ,
       -0.13202159, -0.1933769 , -0.6406481 , -0.11156513,  0.5926341 ,
        0.06085012, -0.35503808, -0.16335812,  0.16911206,  0.04967306,
       -0.35770127, -0.13187137,  0.28350103,  0.38329458, -0.18698655,
        0.3576548 ,  0.2621919 , -0.39865282,  0.10061344,  0.01369211,
        0.01874272,  0.21196674,  0.17969203,  0.29606393,  0.12064955,
        0.15966089, -0.13825649,  0.00201887,  0.04961733,  0.27911547,
        0.2068136 ,  0.39759484,  0.2862901 , -0.09346455,  0.16426812,
       -0.24169806,  0.09997819, -0.44599268,  0.41201797,  0.05641873,
        0.16477604,  0.38001513,  0.35751516,  0.6212802 , -0.64802456,
        0.4957305 , -0.4390477 ,  0.07493012,  0.30132794, -0.20500466,
       -0.57623935,  0.7474966 ,  0.38659403,  0.34189576,  0.00159717,
        0.05664266,  0.01734789,  0.26169544,  0.40239805, -0.04549359,
       -0.2709189 , -0.12730362,  0.2034794 ,  0.2728204 ,  0.72761256,
       -0.21644394,  0.224929  ,  0.2375018 ,  0.07808466,  0.5968954 ,
       -0.6157674 ,  0.04562134,  0.1305397 ,  0.17274481, -0.11353071,
       -0.30207485,  0.5802539 , -0.14269125, -0.2884229 ,  0.17256552,
        0.03507187, -0.4066303 , -0.7145616 , -0.23555996,  0.3471703 ,
       -0.14194548,  0.15702213,  0.07937714, -0.3445561 ,  0.40683508,
        0.08276   ,  0.1830598 , -0.1491115 , -0.51379377,  0.1613577 ,
        0.2038525 , -0.12410001, -0.01298311, -0.02253577, -0.12909622,
        0.47404492,  0.43975922, -0.20137976,  0.24751526, -0.4578353 ,
       -0.17121407,  0.4031764 ,  0.6281439 , -0.37201667, -0.7157249 ,
       -0.3346534 ,  0.39505622,  0.20815326,  0.4146853 , -0.13397437,
       -0.32241178, -0.28611964,  0.2239729 ,  0.5106281 ,  0.07933211,
        0.10782225, -0.40335935, -0.5326187 , -0.30590707, -0.2574664 ,
        0.03093336, -0.06553329,  0.17946768, -0.1607788 ,  0.18338534,
        0.48184794,  0.21211222, -0.54006964,  0.03960855, -0.11404734,
       -0.10145112,  0.104381  , -0.02543829,  0.22347362, -0.47188926,
       -0.04388412, -0.381622  , -0.00662385,  0.09126431, -0.17741907,
        0.2238452 , -0.21930256,  0.01989148,  0.38348085, -0.04271016,
        0.75469744,  0.42083722, -0.18029748, -0.38299614,  0.15710637,
       -0.13982528, -0.16888247, -0.45325318, -0.13775308, -0.19931203,
       -0.17624478,  0.12087023, -0.29658484, -0.01605514, -0.28372398,
       -0.36615852,  0.6057722 , -0.03695723, -0.46147117, -0.28212577,
        0.2345583 , -0.11929718, -0.12919627,  0.34766135,  0.43541175,
       -0.04973225,  0.05530995,  0.00932657,  0.39078236,  0.13453844,
       -0.33692938, -0.36101198,  0.17922904,  0.23996356,  0.12200177,
```

```
        0.15372366,  0.04641432, -0.26532394,  0.5664997 , -0.21465681,
        0.47192666,  0.48681405,  0.06165318, -0.00140859, -0.07751815,
        0.25902453,  0.33716118,  0.0933435 ,  0.20321798, -0.2188937
7],
      dtype=float32)
```

In [19]:
```
word_to_vector.wv.most_similar('like')
```

Out[19]:
```
[('easier', 0.9985899329185486),
 ('helping', 0.9972138404846191),
 ('old', 0.9970157146453857),
 ('way', 0.9969410300254822),
 ('payzapp', 0.996414303779602),
 ('implementation', 0.9963527917861938),
 ('usefull', 0.9963287115097046),
 ('assistant', 0.9962801933288574),
 ('superfast', 0.9962382912635803),
 ('convenient', 0.9961032271385193)]
```

In [20]:
```
vocab=word_to_vector.wv.vocab
print("The total number of words are : ",len(vocab))
```

```
The total number of words are :  4195
```

In [115]:
```
vocab=list(vocab.keys())
```

```
---------------------------------------------------------------------------
AttributeError                            Traceback (most recent call l
ast)
<ipython-input-115-df0749ad1b78> in <module>
----> 1 vocab=list(vocab.keys())

AttributeError: 'list' object has no attribute 'keys'
```

In [29]:
```
word_vec_dict={}
for word in vocab:
  word_vec_dict[word]=word_to_vector.wv.get_vector(word)
print("The no of key-value pairs : ",len(word_vec_dict))
```

```
The no of key-value pairs :  4195
```

In [24]:
```
for word in vocab[:10]:
   print(word_vec_dict[word])
```

```
[-0.07419913 -0.10321775  0.00265361 -0.21512999  0.01568613 -0.3344239
  0.06582711 -0.27462766 -0.14935054  0.22445142  0.1834354  -0.1454997
8
 -0.289622   -0.13039386  0.57221204  0.16234411 -0.11790888 -0.1860562
4
  0.07523745  0.5382129   0.19127086 -0.12885173  0.26667884 -0.1251687
4
  0.20068353  0.23305048  0.22427472 -0.3252583  -0.37920192 -0.0872675
6
  0.10483915 -0.05809722 -0.27856967  0.32453787 -0.4736982  -0.2192707
2
  0.35756394  0.32549903  0.3794477   0.19648665 -0.22308616  0.136525
  0.20081306 -0.21883416 -0.4248831   0.13652278  0.11539008 -0.1819721
2
 -0.39803207  0.4643623  -0.3060231  -0.11206917  0.4524133  -0.1294014
9
  0.04150243  0.06603202  0.10736343 -0.35451    -0.02604143  0.2495846
7
 -0.05645863  0.02627165  0.1667989  -0.20730971  0.12113121 -0.0057584
9
 -0.29922765  0.27824312  0.4270155  -0.28567648  0.48241907 -0.0707561
 -0.11545122 -0.21378155 -0.18688872 -0.14690848  0.12704496 -0.0855068
6
 -0.01449352  0.05939593  0.26511288 -0.23668768  0.06193957  0.4584235
8
 -0.17112553  0.2889054   0.21962434  0.00738907  0.12001012  0.1825827
4
 -0.1731097  -0.00260643  0.25128993  0.25952005 -0.51558673  0.3517716
2
 -0.59409755 -0.04923675  0.0795816  -0.06046148  0.6183736   0.0465093
2
 -0.27187768  0.27693242  0.31246358  0.10465232 -0.23274322  0.2339354
 -0.13316156  0.30782178 -0.04227698 -0.2665993  -0.28518963  0.0514625
9
 -0.27767536  0.13253236  0.31187764 -0.18582335 -0.0432509  -0.3826296
  0.3058563  -0.2324189   0.09429111 -0.12228758 -0.00247362  0.0142767
8
  0.21448857  0.0649298  -0.10142515 -0.1018947  -0.06183772 -0.4842355
5
 -0.0032899   0.13075796 -0.12820776  0.034273    0.24414173 -0.1978209
2
  0.0695549   0.00781778  0.4566554   0.12100962  0.10858848 -0.3520461
6
 -0.20163469 -0.3550713  -0.21471117 -0.2964624  -0.01781067  0.1495698
7
  0.18749802 -0.13388601 -0.10171119 -0.09309794 -0.07846421  0.7041083
 -0.20397964 -0.02643684 -0.01641066  0.18939534  0.22029659  0.0426926
9
  0.39019793  0.32534438  0.29419252 -0.22319114 -0.11064609 -0.1824721
1
  0.11743235  0.01873431 -0.089784   -0.34435448  0.21139067 -0.1492078
  0.46400738 -0.3037844  -0.12350767 -0.05780711 -0.06138583  0.2234797
  0.12287449 -0.90739375 -0.09548461 -0.5345523   0.5469849  -0.4653463
7
 -0.39167327  0.30445352  0.0718676   0.2455056   0.0818961   0.3841874
 -0.01624662 -0.13022898  0.14697206  0.18839723  0.2612721  -0.2898973
  0.09437185  0.21548149 -0.06407     0.21373117 -0.20649502  0.0686517
```

```
3
  0.06125755  0.05107037 -0.04820937 -0.1363728   0.04994626  0.2298802
3
  0.2610537  -0.14339817  0.08108196  0.17489977 -0.30048501 -0.2779537
7
  0.05953629 -0.12915802 -0.21282613 -0.5069634  -0.15493906  0.1841942
4
  0.07925863  0.62980056 -0.21492903  0.07677439 -0.10599712  0.0427256
7
 -0.07703042  0.00277484  0.34240693  0.19358335  0.58126944 -0.2537520
5
 -0.00801032  0.3639556   0.05689868  0.4229347  -0.08670498  0.4138238
4
 -0.32358345 -0.02804025  0.0816872   0.15097256  0.22334549  0.0791118
3
  0.44264433  0.01958761 -0.01242341 -0.03053742  0.18348004  0.4804287
9
  0.10387948  0.08183809 -0.32885775  0.03437039  0.29543135  0.2827359
4
  0.24038674  0.3085363   0.3400897   0.34362304 -0.5030696   0.3556074
5
 -0.10745851 -0.01109441  0.05950803 -0.08614665 -0.00169566  0.2197326
3
 -0.2165677  -0.23305844  0.37048417  0.1059451   0.13727461  0.1457713
5
  0.16988128 -0.35789672 -0.05343907 -0.02950831 -0.09091413  0.8867192
  0.51108986  0.29990965  0.08269958 -0.1001724  -0.2647178   0.3308109
3
 -0.17579153  0.07871038 -0.08258517  0.05929472  0.13789381 -0.1013505
8
 -0.2095916   0.20230152 -0.38412815 -0.01095284 -0.15359552  0.2844799
2]
[ 1.24517158e-01 -1.00679703e-01 -3.81282091e-01 -1.79641604e-01
 -1.43779859e-01 -2.98292696e-01  3.04140225e-02 -2.72089779e-01
 -6.11608513e-02 -2.17266887e-01  1.30572692e-01 -1.27460575e-02
 -3.47781479e-02 -4.66875523e-01  5.73453844e-01  2.33803272e-01
  5.85111976e-03 -9.98597965e-02  1.31955788e-01  2.36493543e-01
  7.64627159e-01 -1.16103940e-01  5.56650013e-02 -2.28054866e-01
  1.94666088e-01 -8.69212206e-03  3.45833302e-01 -3.55194241e-01
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]
```

In [22]:
```
data_copy['clean_review']=data_copy['Review Text'].apply(clean_reviews)
```

In [23]:
```
data_copy
```

Out[23]:

	Review Text	Star Rating	clean_review
0	Very bad wallet balance not use.	1	bad wallet balance use
1	Froud app i recharge 199 but not done also sen...	1	froud app recharge done also send mail niki ev...
2	Waste to write comments also	2	waste write comment also
3	Nice apo	5	nice apo
4	Good nice app	5	good nice app
5	Ghatiya app. Bill fetch nhi hota ..	1	ghatiya app bill fetch nhi hota
6	They showed recharge successful but I didn't got	1	showed recharge successful got
7	This is good app for recharge and electric bil...	5	good app recharge electric bill payment
8	Worst app i never had seen before	1	worst app never seen
9	Good	4	good
10	Superb app	5	superb app
11	I m selecting UPW as a circle but it's only sh...	1	selecting upw circle show karnataka mumbai cir...
12	Refer hum Kar Hi Nahi Payenge aapke product ke...	1	refer hum kar hi nahi payenge aapke product ke...
13	good apps	4	good apps
14	Excellent	5	excellent
15	excellent	5	excellent
16	Super	5	super
17	aswm	5	aswm
18	nice app	5	nice app
19	App is not working properly	1	app working properly
20	Good aap	5	good aap
21	Well I just love it 😊 😊 that's all I could say	5	well love could say
22	So far I am happy	3	far happy
23	Amazing assistant, makes work easier.	5	amazing assistant make work easier
24	Non sense app . no confirmation of payments , ...	1	non sense app confirmation payment money debit...
25	Bad experience	1	bad experience
26	Yesterday I done one recharge via amazon pay b...	1	yesterday done one recharge via amazon pay til...
27	Customer support is awesome	5	customer support awesome
28	It's annoying. When you try to make transactio...	1	annoying try make transaction number rather re...
29	It very very friendly app ,thank you so much	5	friendly app thank much

	Review Text	Star Rating	clean_review
...	...	...	...
5653	Customer support is very poor	1	customer support poor
5654	cool	4	cool
5655	Worse app, they are unable to proper service.	1	worse app unable proper service
5656	Worst App. Proper customer support is not ther...	1	worst app proper customer support raised compl...
5658	I did my first transaction today. Really happy...	5	first transaction today really happy service f...
5659	This app is best while booking ola cab😀 and it...	5	app best booking ola cab ease use
5660	Best application you should try once	5	best application try
5661	try now	5	try
5662	All the utility bill,recharge and can service ...	5	utility bill recharge service go handy service...
5663	There was offer of free movie ticket.now it is...	4	offer free movie ticket showing error
5664	I hav recharged my jio no. But the recharge ha...	1	hav recharged jio recharge succesful balance a...
5665	worst app ever , I can't even change my operot...	1	worst app ever even change operotor showing id...
5666	Very very worse app Dosto don't use this app b...	1	worse app dosto use app deducted balance accou...
5667	Very nice good job	5	nice good job
5668	Very nicely portrayed.	5	nicely portrayed
5670	Suparrr app	5	suparrr app
5671	not working in my phone..	1	working phone
5673	Lost 996/-... Not responding to my chat,.. No ...	1	lost responding chat cash back first transacti...
5674	Improved now it's working fine	4	improved working fine
5675	I want this type of application from many days...	5	want type application many day finally found l...
5676	Easy to use	4	easy use
5677	I have invitation code, but unable to register	3	invitation code unable register
5678	from last 24 hours , bill payment is unavailab...	1	last hour bill payment unavailable pls start asap
5679	Good interactive service	5	good interactive service
5680	Worst app i ever face its debit my money from ...	1	worst app ever face debit money yes bank net b...
5682	so many negative comments made my mind set not...	1	many negative comment made mind set install app

	Review Text	Star Rating	clean_review
5685	Importants have been done, keep it up	5	importants done keep
5686	very good aaps	5	good aaps
5690	I'm already a Lazypay account holder using sam...	2	already lazypay account holder using ticket bo...
5691	It's so easy to use, I'm just using and fallin...	5	easy use using falling love app many payment o...

4659 rows × 3 columns

In [24]:
```
maxi=-1
data_copy['clean_review'].dropna(inplace=True)
for i,rev in enumerate(data_copy['clean_review']):
  tokens=rev.split()
  if(len(tokens)>maxi):
    maxi=len(tokens)
print(maxi)
```

```
103
```

In [25]:
```
tok = Tokenizer()
tok.fit_on_texts(data_copy['clean_review'])
vocab_size = len(tok.word_index) + 1
encd_rev = tok.texts_to_sequences(data_copy['clean_review'])
```

In [26]:
```
encd_rev
```

Out[26]:
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```

In [27]:
```
pad_rev= pad_sequences(encd_rev, maxlen=maxi+1, padding='post')
pad_rev
```

Out[27]:
```
array([[  33,   94,   96, ...,    0,    0,    0],
       [ 643,    1,    2, ...,    0,    0,    0],
       [  62,  470,  597, ...,    0,    0,    0],
       ...,
       [   3, 1017,    0, ...,    0,    0,    0],
       [ 214,  374,   50, ...,    0,    0,    0],
       [  44,    7,   63, ...,    0,    0,    0]], dtype=int32)
```

In [30]:
```
embed_dim=300
embed_matrix=np.zeros(shape=(vocab_size,embed_dim))
for word,i in tok.word_index.items():
  embed_vector=word_vec_dict.get(word)
  if embed_vector is not None:  # word is in the vocabulary learned by t
he w2v model
    embed_matrix[i]=embed_vector
```

In [31]:

```
[-1.70854181e-01  2.37646252e-01 -2.76501656e-01 -4.25988138e-01
  8.39287639e-02 -3.66834760e-01  5.63306659e-02  7.25599706e-01
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```

Out[31]: 1258800

In [31]:
```
Y=keras.utils.to_categorical(data_copy['Star Rating'])
Y
```

Out[31]:
```
array([[0., 1., 0., 0., 0., 0.],
       [0., 1., 0., 0., 0., 0.],
       [0., 0., 1., 0., 0., 0.],
       ...,
       [0., 0., 0., 0., 0., 1.],
       [0., 0., 1., 0., 0., 0.],
       [0., 0., 0., 0., 0., 1.]], dtype=float32)
```

In [131]:
```

```

```
---------------------------------------------------------------------
----
TypeError                                 Traceback (most recent call l
ast)
<ipython-input-131-3747cbf9b20d> in <module>
----> 1 for i in data_copy['Review Text']:
      2     if(i.isna()):
      3         print(data_copy['Star Rating'])

TypeError: 'NoneType' object is not subscriptable
```

In [33]:
```
x_train,x_test,y_train,y_test=train_test_split(pad_rev,Y,test_size=0.20,
random_state=42)
```

In [34]:
```
x_train
```

Out[34]:
```
array([[   3,   21,  224, ...,    0,    0,    0],
       [ 622,    5,  105, ...,    0,    0,    0],
       [  25,   47,    2, ...,    0,    0,    0],
       ...,
       [   3, 3415,    0, ...,    0,    0,    0],
       [  20,    1,  141, ...,    0,    0,    0],
       [  21,    1,   10, ...,    0,    0,    0]], dtype=int32)
```

In [35]:
```
x_test
```

Out[35]:
```
array([[ 299,   92,   97, ...,    0,    0,    0],
       [1166,  125,   72, ...,    0,    0,    0],
       [  45,    1,  204, ...,    0,    0,    0],
       ...,
       [ 126,    1,    0, ...,    0,    0,    0],
       [ 157,  223,   25, ...,    0,    0,    0],
       [   6,  154,  395, ...,    0,    0,    0]], dtype=int32)
```

In [36]:
```
y_train
```

Out[36]:
```
array([[0., 0., 0., 0., 0., 1.],
       [0., 1., 0., 0., 0., 0.],
       [0., 0., 0., 0., 1., 0.],
       ...,
       [0., 0., 0., 0., 0., 1.],
       [0., 0., 0., 0., 0., 1.],
       [0., 0., 0., 0., 0., 1.]], dtype=float32)
```

In [46]:
```
y_test.shape
```

Out[46]:
```
(932, 6)
```

In [36]:
```
from keras.initializers import Constant
from keras.layers import ReLU
from keras.layers import Dropout
model=Sequential()
model.add(Embedding(input_dim=vocab_size,output_dim=embed_dim,input_leng
th=maxi+1,embeddings_initializer=Constant(embed_matrix)))
# model.add(CuDNNLSTM(64,return_sequences=False)) # loss stucks at about
model.add(Flatten())
model.add(Dense(16,activation='relu'))
model.add(Dropout(0.50))
# model.add(Dense(16,activation='relu'))
# model.add(Dropout(0.20))
model.add(Dense(6,activation='sigmoid'))
```

In [37]:
```
model.summary()
```

```
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
embedding_1 (Embedding)      (None, 104, 300)          1258800
_________________________________________________________________
flatten_1 (Flatten)          (None, 31200)             0
_________________________________________________________________
dense_1 (Dense)              (None, 16)                499216
_________________________________________________________________
dropout_1 (Dropout)          (None, 16)                0
_________________________________________________________________
dense_2 (Dense)              (None, 6)                 102
=================================================================
Total params: 1,758,118
Trainable params: 1,758,118
Non-trainable params: 0
_________________________________________________________________
```

In [38]:
```
model.compile(optimizer=keras.optimizers.RMSprop(lr=1e-3),loss='binary_c
rossentropy',metrics=['accuracy'])
```

In [54]:
```
epochs=7
batch_size=64
```

In [55]:
```
model.fit(x_train,y_train,epochs=epochs,batch_size=batch_size,validation
_data=(x_test,y_test))
```

```
Train on 3727 samples, validate on 932 samples
Epoch 1/7
3727/3727 [==============================] - 3s 908us/step - loss: 0.29
39 - acc: 0.8848 - val_loss: 0.2671 - val_acc: 0.8988
Epoch 2/7
3727/3727 [==============================] - 3s 892us/step - loss: 0.27
94 - acc: 0.8923 - val_loss: 0.2636 - val_acc: 0.9070
Epoch 3/7
3727/3727 [==============================] - 3s 902us/step - loss: 0.26
88 - acc: 0.8986 - val_loss: 0.2531 - val_acc: 0.9083
Epoch 4/7
3727/3727 [==============================] - 3s 905us/step - loss: 0.25
40 - acc: 0.9035 - val_loss: 0.2616 - val_acc: 0.9024
Epoch 5/7
3727/3727 [==============================] - 3s 910us/step - loss: 0.24
26 - acc: 0.9118 - val_loss: 0.2681 - val_acc: 0.8999
Epoch 6/7
3727/3727 [==============================] - 3s 908us/step - loss: 0.23
59 - acc: 0.9149 - val_loss: 0.2554 - val_acc: 0.9047
Epoch 7/7
3727/3727 [==============================] - 3s 905us/step - loss: 0.23
08 - acc: 0.9178 - val_loss: 0.2689 - val_acc: 0.9095
```

Out[55]:
```
<keras.callbacks.History at 0x12a257fd0>
```

In [59]:
```
test=pd.read_csv(r'/Users/shubhamkumar/Downloads/testdata.csv')
```

In [56]:
```
loss, accuracy = model.evaluate(x_train,y_train, verbose=0)
print('Accuracy: %f' % (accuracy*100))
print(loss)
```

```
Accuracy: 93.918255
0.16676039087179043
```

In [60]:
```
test_data=test.copy()
```

In [61]:
```
test_data=test_data.drop([ 'App Version Code','App Version Name','Review
Title'], axis=1)
```

In [62]:
```
test_data=test_data.dropna()
```

In [63]:
```
test_data['Review Text'].isnull().sum()
```

Out[63]:
```
0
```

In [64]:
```
test
sentences_for_test=[]
sum=0
for reviews in test_data['Review Text']:
  #reviews=reviews.strip()
  sents=tokenizer.tokenize(reviews.strip())
  #print(sents)
  sum+=len(sents)
  for sent in sents:
    cleaned_sent=clean_reviews(sent)
    sentences_for_test.append(cleaned_sent.split()) # can use word_token
ize also.
print(sum)
print(len(sentences_for_test))
```

```
2190
2190
```

In [65]:
```
test_data
```

Out[65]:

	id	Review Text
0	bdcb3129-afc1-4608-825f-558fe9c17e2b	Awesome app, all should use it
1	7518d5c8-5e35-45e2-b29d-cf0996ba9e2f	how can i stop notification
2	b21ca913-ba44-471b-91e1-aaf035379a84	This app is very easy to use , nice graphics ,...
3	beaaa17d-44af-44c8-ba38-24ba54c3b17d	Quite good but felt slow response from cc. Ove...
4	89d8c4f0-6fe0-4389-b1f8-913ba894c0f1	Not getting otp for login since yesterday. Als...
5	16e57197-186e-44ef-ac4c-6f6a13e787ee	What's different?
6	04a33480-0544-433d-af9d-e8c0777cadfb	This is very good but please provide some good...
7	5a5b705a-e3d8-4424-989c-05d078b6a461	Excellent,but niki credit amount is only 25% used
8	00aad18b-1960-464c-9334-0961a9f1d65c	Nice app
9	ce2a2f18-bfba-4430-afc5-be587a190d77	I didn't receive cashbook for first time DTH r...
10	3a2abaa4-42c2-4df4-840d-52ac21f296d6	Very good super
11	4db50ec7-89de-4765-b324-b1ef02afe7e8	IT'S A BEST APPLICATION FOR PAYMENTS
12	0c64ee57-c3d7-4dcf-bc46-351e5832f5ff	Very user friendly app
13	c94b633c-db13-4723-8192-4010e331bf0c	This app very easy to use and pay bill and so on
14	694c834c-4711-4815-bac1-fbab70deb701	Worst apps denied cashback
15	6e8187ff-9601-4327-b33d-83cc79d8745b	School Boy App
16	cf3ce256-7de3-4691-ac71-12801b0a96bb	I had refered around 20 friends andI have not ...
17	6cbca408-e7d6-42be-aaec-bf0aec416325	Hellow i recived cashback and i recharge again...
18	f4823dc4-d588-43db-942a-8defa02d311b	No BSNL landline payments option. No electrici...
19	e08a6211-f8a2-413f-868a-852211bad6d3	Satisfied app
20	ff2f78a0-06aa-4c5f-8a42-34db98dcb6c9	Make life easy
21	b348b36e-0634-42ca-813b-d3cf49ab3dd9	good app
22	9513b19e-8080-433b-a48b-48661bc7e44c	Worse app...don't except lazypay
23	ecde28f3-5645-40cc-981f-efe91271197a	Convenience charge is very high
24	f2f45f08-3ec2-42a2-a272-2ae0501a9c65	Nice app and faster
25	6c728985-aeac-462c-9bbb-1c6b310c36a5	Worst app ever.assistant response is very slow
26	4fe0b7a3-3d8c-42d2-bc3d-802617b7388e	Worst experience ever in this kind of app.
27	c16572a1-6d65-4ace-9e03-eccb2351b03e	Nice .... keep it up
28	4bfbb4ff-d4d7-4486-9848-a8c5bfd908af	On 26/06 tried to recharge mobile with R's.251...
29	0205efb9-26f7-45e2-9166-098b0a25176e	Cheated me..... jbl earphones for free... i ...
...	...	...
1394	1dc4365c-e6cc-4f73-beeb-d5ac95817b61	Its not even recognizing the intent of questio...
1395	8f9e10f7-d197-4ca6-a1e3-5229aa20f881	Use my refferal.code and get 50 rs. . My code ...
1396	43304e71-fccc-4910-b6f1-3ae3bb0fc4a6	Chatting app my last 2 bill payment not receiv...

	id	Review Text
1397	14c418aa-1c4b-465f-b518-cab34e41e609	good app
1398	ce8ed196-2d0e-4324-a210-673a8ab00aa2	not to use full , no easy use
1399	d21a8c03-e1f8-432a-b214-08c016210de6	I have 50 credits and i m trying to recharge b...
1400	17625bb1-1359-43ad-80b7-275d6b6a549e	I have paid gas bill today for 819 out of whic...
1401	5f5c2196-4a7c-465f-a91a-be760fe57ed5	Easy to sing, up and use
1402	cf84eb75-882e-4b55-9075-47de487f6af5	worst app i pay my electricity bill payment my...
1403	79bc13bd-dd37-40ac-a54d-268c8901ae95	Hate this app approx 20-25 notification and 5-...
1404	9d004708-b1ab-4d7c-8350-7c46e1b5d4b3	Please provide CESCOM electricity bill payment...
1405	33844910-88a2-4d72-ad36-540372ba3a58	Super app giving super benifit for referral an...
1406	ab56e9e3-2e9f-48be-9353-c2a33a1674f3	Is good app
1407	ad7126d8-fc52-40fa-930c-61668abf009a	Super app
1408	70e80829-30bc-4d0c-87f3-a64a478e7a8a	niki is one of the best .I love it . when i do...
1409	4abc7ba3-70cc-44e7-be72-88e3c96ee98d	No cash back after my recharge.
1410	18bf477d-ee05-4141-9e88-5b557c423401	It's awesome app
1411	2aeb0113-6f96-44c6-87d1-98edef59374d	Good app
1412	88ddeb5e-81d8-41a2-ad5d-a03084971c96	It's a nice app but if you allow users to use ...
1413	33464858-480e-495f-a367-f56db6094998	Good cashback offers
1414	c7028857-e2d6-4350-a014-0f5ff50b4d20	This app is really useful and also fun to use ...
1415	33c73fb0-3bbf-4b3d-836d-86bf8ef469ca	VERY NICE APP FOR RECHARGE.
1416	27eaac02-3442-45fb-8c3b-5dfacc8cd25d	Hopeless app never got cash back. Bakvas app
1417	91f08e60-7c79-4dd3-b358-4fa97ee07b7d	Till now it's good than don't know
1418	aa7300e7-1bdf-4dba-91aa-aa34c99ba8d9	Love it
1419	6f1ab3b4-3bc0-4b8f-bb1f-2242c7d971d1	Nice app
1420	c1043055-6240-48bc-8bbe-399a83c58d96	Great idea All in o e app
1421	a2a7be3d-41ce-472c-9e1e-eca354eedd0f	Good
1422	af96d36d-42a1-4c8a-9e01-6ac1b2fbee5e	not able to redeem in paytm
1423	0c30ae30-d3c9-4a6d-b6b3-ff17210839f5	5 din ho gaye gift card buy kiye hoye abhi tak...

1423 rows × 2 columns

In [66]:
```
for te in sentences_for_test[:5]:
  print(te,"\n")
```

```
['awesome', 'app', 'use']

['stop', 'notification']

['app', 'easy', 'use', 'nice', 'graphic', 'great', 'ui', 'ola', 'cab',
'easy', 'book']

['quite', 'good', 'felt', 'slow', 'response', 'cc']

['good', 'app']
```

In [61]:
```

```

In [67]:
```
word_to_vector_test=gensim.models.Word2Vec(sentences=sentences_for_test,
size=300,window=10,min_count=1)
```

In [68]:
```
word_to_vector_test
```

Out[68]:
```
<gensim.models.word2vec.Word2Vec at 0x125c04ef0>
```

In [69]:
```
word_to_vector_test.train(sentences_for_test,epochs=10,total_examples=le
n(sentences_for_test))
```

Out[69]:
```
(91285, 117310)
```

In [70]:
```
vocab_test=word_to_vector_test.wv.vocab
print("The total number of words are : ",len(vocab_test))
```

```
The total number of words are :  2090
```

In [75]:
```
word_to_vector_test.wv.get_vector('like')
```

Out[75]:
```
array([-2.99385656e-02, -5.25346659e-02, -5.52988984e-02,  2.15168353e-
02,
       -5.86143397e-02, -2.01554433e-01,  4.89915386e-02, -3.21782798e-
01,
        2.55071260e-02,  1.17215686e-01,  9.63850841e-02, -8.29592273e-
02,
       -2.45149657e-01, -6.75448999e-02,  3.86764228e-01,  2.10250750e-
01,
        6.67537078e-02, -1.76240429e-01, -2.50241831e-02,  2.38247722e-
01,
        3.01902294e-01, -6.09057620e-02,  2.41731688e-01, -9.77352783e-
02,
        3.32722776e-02,  1.01369537e-01,  9.57358703e-02, -2.64383346e-
01,
       -4.07724649e-01, -3.81620564e-02, -5.87214492e-02, -1.90234765e-
01,
       -1.97461441e-01,  2.22023576e-01, -3.16096514e-01,  1.97217800e-
02,
        4.05144662e-01,  3.56662929e-01,  3.58829498e-01,  1.83789939e-
01,
       -2.77616270e-02,  1.19517013e-01,  2.29521379e-01, -7.99981952e-
02,
       -2.35887185e-01, -7.02987909e-02, -3.58226076e-02, -1.13037631e-
01,
       -4.48284864e-01,  4.92482245e-01,  3.30151655e-02, -5.11679575e-
02,
        1.95134297e-01,  6.35502413e-02, -4.00428101e-02,  1.74675286e-
01,
       -2.07350068e-02, -1.34390548e-01,  6.69464022e-02,  8.58706832e-
02,
       -7.33422721e-03,  2.47849133e-02,  1.46801740e-01, -4.78279181e-
02,
        1.46764964e-02,  4.48161513e-02, -1.66692317e-01,  1.68448389e-
01,
        2.79588223e-01, -2.92878568e-01,  3.34994107e-01,  1.88643411e-
01,
       -5.19652367e-02, -1.71959758e-01,  9.26326141e-02, -3.35898370e-
01,
        2.40741260e-02, -7.41761625e-02, -5.94117828e-02,  1.33548826e-
01,
        5.94420321e-02, -1.01673640e-01, -1.18414603e-01,  4.24110562e-
01,
       -2.09695384e-01,  1.71282694e-01,  2.52422363e-01,  4.33940478e-
02,
        4.28243168e-02, -3.85412611e-02,  1.75065964e-01, -4.39150371e-
02,
        1.82686046e-01,  2.17891455e-01, -4.11590844e-01,  3.58589143e-
01,
       -3.61631244e-01, -3.04546714e-01,  5.79367280e-02,  1.18364900e-
01,
        4.69221950e-01,  1.63695589e-01, -2.85638630e-01,  5.39739020e-
02,
        3.27548593e-01,  1.57074302e-01, -1.80467650e-01, -4.94388025e-
03,
       -1.41917676e-01,  2.05470785e-01,  3.98850068e-02, -2.26431102e-
01,
       -1.86471909e-01, -7.53039271e-02, -2.10980624e-01,  1.38187811e-
```

```
01,
        1.27427205e-01, -3.26419547e-02,  2.29781233e-02, -4.53823805e-
01,
        3.40504825e-01, -1.36507705e-01,  7.07003325e-02, -3.44343260e-
02,
       -3.14608961e-01,  1.21045686e-01,  1.65800691e-01,  1.78385153e-
01,
       -1.00033008e-01, -1.71956375e-01,  6.65188283e-02, -4.11022186e-
01,
        1.84208974e-02,  1.73818871e-01, -1.06903479e-01, -4.67041247e-
02,
        2.37071186e-01, -2.29836226e-01, -9.20259207e-02, -2.17223782e-
02,
        3.93144399e-01,  4.49076518e-02,  2.69632079e-02, -3.02121758e-
01,
       -2.56183863e-01, -3.31247449e-01, -3.33536088e-01, -2.18714148e-
01,
        8.62106159e-02,  2.61705637e-01,  2.43243918e-01, -5.87872341e-
02,
       -4.16116007e-02, -2.24747807e-02, -5.42486669e-04,  7.06464410e-
01,
       -1.88393131e-01, -1.17488414e-01,  5.01367152e-02,  3.27166468e-
01,
        2.51147151e-01, -1.48919106e-01,  3.13176036e-01,  1.41247973e-
01,
        2.80720860e-01, -3.14002670e-02, -1.14150077e-01, -2.47524709e-
01,
       -1.21200092e-01,  1.20113879e-01,  6.21726848e-02, -2.67929584e-
01,
        1.91218510e-01, -9.94229689e-02,  2.71774411e-01, -1.30850464e-
01,
       -8.32333416e-02,  4.00166698e-02,  2.69254427e-02,  2.01347709e-
01,
        1.34778619e-01, -8.42175364e-01, -5.89994639e-02, -5.35466611e-
01,
        4.64673877e-01, -2.27592409e-01, -3.81244749e-01,  1.58156529e-
01,
       -5.99273965e-02,  1.38519466e-01,  6.62089884e-02,  1.92420051e-
01,
       -1.69481654e-02, -9.87955406e-02,  2.06458494e-01,  8.79281238e-
02,
        2.24948958e-01, -3.03428978e-01,  1.05876967e-01,  1.13694429e-
01,
       -3.11017483e-01,  1.43436834e-01, -2.63765335e-01,  9.88826379e-
02,
        6.90692812e-02,  5.75152412e-02,  6.69100806e-02, -8.77121836e-
02,
       -6.73124865e-02,  4.05164063e-01,  2.54343003e-01, -2.07696483e-
01,
        4.26453538e-02,  6.81111515e-02, -3.55941027e-01, -6.84561282e-
02,
       -1.77752525e-01, -1.64603561e-01, -2.18084566e-02, -3.59450042e-
01,
       -1.78568617e-01,  3.69627446e-01, -2.12746579e-03,  4.29233909e-
01,
        1.36400953e-01,  1.28297925e-01,  1.80464447e-01,  2.34141154e-
03,
```

```
       -1.47102311e-01,  1.82808727e-01,  3.94675285e-01,  1.77949101e-
01,
        5.09173751e-01, -2.59238482e-01,  3.07669789e-02,  2.56117731e-
01,
        1.71158597e-01,  1.41294122e-01, -1.78536981e-01,  2.20734224e-
01,
       -1.07819065e-01,  2.29410175e-02, -3.71303153e-03,  6.46740869e-
02,
        1.18124060e-01, -1.09959804e-01,  3.45968515e-01,  1.20243296e-
01,
       -1.35069147e-01, -2.82235861e-01,  2.88137376e-01,  5.59655309e-
01,
       -2.35275067e-02,  1.24871410e-01, -2.23637298e-01,  6.99490979e-
02,
        6.28726855e-02,  9.38031375e-02,  1.47085384e-01,  1.99464843e-
01,
        1.29643559e-01,  3.22578490e-01, -4.07642931e-01,  2.85623640e-
01,
       -1.64390355e-01,  1.28960744e-01,  3.41009311e-02, -2.65542626e-
01,
       -1.00008316e-01,  7.63507113e-02, -1.81405365e-01, -2.52787381e-
01,
        2.14421108e-01,  1.16931669e-01,  2.09019165e-02, -7.96697363e-
02,
        8.46355781e-02, -7.79208168e-02, -2.76415795e-01,  9.43632424e-
03,
       -2.15315241e-02,  6.64457440e-01,  3.07483763e-01,  3.31551969e-
01,
        1.99057803e-01, -3.04269837e-04, -1.64248973e-01,  1.84459776e-
01,
       -1.72881573e-01,  6.38165474e-02, -7.14987069e-02, -4.78820018e-
02,
        1.62941426e-01, -1.08129211e-01, -4.43645231e-02,  2.56602317e-
01,
       -4.62835550e-01,  1.40039429e-01,  4.18801010e-02,  2.22532794e-
01],
      dtype=float32)
```

In [76]:
```
word_to_vector_test.wv.most_similar('like')
```

Out[76]:
```
[('say', 0.9999732971191406),
 ('u', 0.9999719858169556),
 ('much', 0.9999712705612183),
 ('chat', 0.9999702572822571),
 ('issue', 0.9999696016311646),
 ('ho', 0.9999696016311646),
 ('work', 0.9999690055847168),
 ('able', 0.9999687671661377),
 ('apps', 0.9999686479568481),
 ('one', 0.9999685883522034)]
```

In [71]:
```
vocab_test=word_to_vector_test.wv.vocab
print("The total number of words are : ",len(vocab_test))
```

```
The total number of words are :  2090
```

In [72]:
```
vocab_test=list(vocab_test.keys())
vocab_test
```

Out[72]:
```
['awesome',
 'app',
 'use',
 'stop',
 'notification',
 'easy',
 'nice',
 'graphic',
 'great',
 'ui',
 'ola',
 'cab',
 'book',
 'quite',
 'good',
 'felt',
 'slow',
 'response',
 'cc',
 'getting',
 'otp',
 'login',
 'since',
 'yesterday',
 'also',
 'one',
 'proving',
 'support',
 'different',
 'please',
 'provide',
 'offer',
 'cubber',
 'wallet',
 'balance',
 'excellent',
 'niki',
 'credit',
 'amount',
 'used',
 'receive',
 'cashbook',
 'first',
 'time',
 'dth',
 'recharge',
 'super',
 'best',
 'application',
 'payment',
 'user',
 'friendly',
 'pay',
 'bill',
 'worst',
 'apps',
 'denied',
```

```
'cashback',
'school',
'boy',
'refered',
'around',
'friend',
'andi',
'received',
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In [73]:
```
word_vec_dict_test={}
for word in vocab_test:
  word_vec_dict_test[word]=word_to_vector_test.wv.get_vector(word)
print("The no of key-value pairs : ",len(word_vec_dict_test))
```

```
The no of key-value pairs :  2090
```

In [75]:
```
test_data['clean_review']=test_data['Review Text'].apply(clean_reviews)
```

In [76]:
```
test_data
```

Out[76]:

	id	Review Text	clean_review
0	bdcb3129-afc1-4608-825f-558fe9c17e2b	Awesome app, all should use it	awesome app use
1	7518d5c8-5e35-45e2-b29d-cf0996ba9e2f	how can i stop notification	stop notification
2	b21ca913-ba44-471b-91e1-aaf035379a84	This app is very easy to use , nice graphics ,...	app easy use nice graphic great ui ola cab eas...
3	beaaa17d-44af-44c8-ba38-24ba54c3b17d	Quite good but felt slow response from cc. Ove...	quite good felt slow response cc good app
4	89d8c4f0-6fe0-4389-b1f8-913ba894c0f1	Not getting otp for login since yesterday. Als...	getting otp login since yesterday also one pro...
5	16e57197-186e-44ef-ac4c-6f6a13e787ee	What's different?	different
6	04a33480-0544-433d-af9d-e8c0777cadfb	This is very good but please provide some good...	good please provide good offer cubber wallet b...
7	5a5b705a-e3d8-4424-989c-05d078b6a461	Excellent,but niki credit amount is only 25% used	excellent niki credit amount used
8	00aad18b-1960-464c-9334-0961a9f1d65c	Nice app	nice app
9	ce2a2f18-bfba-4430-afc5-be587a190d77	I didn't receive cashbook for first time DTH r...	receive cashbook first time dth recharge app
10	3a2abaa4-42c2-4df4-840d-52ac21f296d6	Very good super	good super
11	4db50ec7-89de-4765-b324-b1ef02afe7e8	IT'S A BEST APPLICATION FOR PAYMENTS	best application payment
12	0c64ee57-c3d7-4dcf-bc46-351e5832f5ff	Very user friendly app	user friendly app
13	c94b633c-db13-4723-8192-4010e331bf0c	This app very easy to use and pay bill and so on	app easy use pay bill
14	694c834c-4711-4815-bac1-fbab70deb701	Worst apps denied cashback	worst apps denied cashback
15	6e8187ff-9601-4327-b33d-83cc79d8745b	School Boy App	school boy app
16	cf3ce256-7de3-4691-ac71-12801b0a96bb	I had refered around 20 friends andI have not ...	refered around friend andi received refer earn...
17	6cbca408-e7d6-42be-aaec-bf0aec416325	Hellow i recived cashback and i recharge again...	hellow recived cashback recharge money cutting...
18	f4823dc4-d588-43db-942a-8defa02d311b	No BSNL landline payments option. No electrici...	bsnl landline payment option electricity bill ...
19	e08a6211-f8a2-413f-868a-852211bad6d3	Satisfied app	satisfied app
20	ff2f78a0-06aa-4c5f-8a42-34db98dcb6c9	Make life easy	make life easy
21	b348b36e-0634-42ca-813b-d3cf49ab3dd9	good app	good app
22	9513b19e-8080-433b-a48b-48661bc7e44c	Worse app...don't except lazypay	worse app except lazypay

	id	Review Text	clean_review
23	ecde28f3-5645-40cc-981f-efe91271197a	Convenience charge is very high	convenience charge high
24	f2f45f08-3ec2-42a2-a272-2ae0501a9c65	Nice app and faster	nice app faster
25	6c728985-aeac-462c-9bbb-1c6b310c36a5	Worst app ever.assistant response is very slow	worst app ever assistant response slow
26	4fe0b7a3-3d8c-42d2-bc3d-802617b7388e	Worst experience ever in this kind of app.	worst experience ever kind app
27	c16572a1-6d65-4ace-9e03-eccb2351b03e	Nice .... keep it up	nice keep
28	4bfbb4ff-d4d7-4486-9848-a8c5bfd908af	On 26/06 tried to recharge mobile with R's.251...	tried recharge mobile r r used niki account tr...
29	0205efb9-26f7-45e2-9166-098b0a25176e	Cheated me..... jbl earphones for free... i ...	cheated jbl earphone free didnt wven see ghe a...
...	...	...	...
1394	1dc4365c-e6cc-4f73-beeb-d5ac95817b61	Its not even recognizing the intent of questio...	even recognizing intent question keep giving a...
1395	8f9e10f7-d197-4ca6-a1e3-5229aa20f881	Use my refferal.code and get 50 rs. . My code ...	use refferal code get r code gagan
1396	43304e71-fccc-4910-b6f1-3ae3bb0fc4a6	Chatting app my last 2 bill payment not receiv...	chatting app last bill payment received fake a...
1397	14c418aa-1c4b-465f-b518-cab34e41e609	good app	good app
1398	ce8ed196-2d0e-4324-a210-673a8ab00aa2	not to use full , no easy use	use full easy use
1399	d21a8c03-e1f8-432a-b214-08c016210de6	I have 50 credits and i m trying to recharge b...	credit trying recharge bit say debit r u pay r...
1400	17625bb1-1359-43ad-80b7-275d6b6a549e	I have paid gas bill today for 819 out of whic...	paid gas bill today credit point rest amazon p...
1401	5f5c2196-4a7c-465f-a91a-be760fe57ed5	Easy to sing, up and use	easy sing use
1402	cf84eb75-882e-4b55-9075-47de487f6af5	worst app i pay my electricity bill payment my...	worst app pay electricity bill payment amount ...
1403	79bc13bd-dd37-40ac-a54d-268c8901ae95	Hate this app approx 20-25 notification and 5-...	hate app approx notification message daily cam...
1404	9d004708-b1ab-4d7c-8350-7c46e1b5d4b3	Please provide CESCOM electricity bill payment...	please provide cescom electricity bill payment...
1405	33844910-88a2-4d72-ad36-540372ba3a58	Super app giving super benifit for referral an...	super app giving super benifit referral specia...
1406	ab56e9e3-2e9f-48be-9353-c2a33a1674f3	Is good app	good app
1407	ad7126d8-fc52-40fa-930c-61668abf009a	Super app	super app
1408	70e80829-30bc-4d0c-87f3-a64a478e7a8a	niki is one of the best .I love it . when i do...	niki one best I love recharge niki give amazon...
1409	4abc7ba3-70cc-44e7-be72-88e3c96ee98d	No cash back after my recharge.	cash back recharge

	id	Review Text	clean_review
1410	18bf477d-ee05-4141-9e88-5b557c423401	It's awesome app	awesome app
1411	2aeb0113-6f96-44c6-87d1-98edef59374d	Good app	good app
1412	88ddeb5e-81d8-41a2-ad5d-a03084971c96	It's a nice app but if you allow users to use ...	nice app allow user use credit people start us...
1413	33464858-480e-495f-a367-f56db6094998	Good cashback offers	good cashback offer
1414	c7028857-e2d6-4350-a014-0f5ff50b4d20	This app is really useful and also fun to use ...	app really useful also fun use chatbot interface
1415	33c73fb0-3bbf-4b3d-836d-86bf8ef469ca	VERY NICE APP FOR RECHARGE.	nice app recharge
1416	27eaac02-3442-45fb-8c3b-5dfacc8cd25d	Hopeless app never got cash back. Bakvas app	hopeless app never got cash back bakvas app
1417	91f08e60-7c79-4dd3-b358-4fa97ee07b7d	Till now it's good than don't know	till good know
1418	aa7300e7-1bdf-4dba-91aa-aa34c99ba8d9	Love it	love
1419	6f1ab3b4-3bc0-4b8f-bb1f-2242c7d971d1	Nice app	nice app
1420	c1043055-6240-48bc-8bbe-399a83c58d96	Great idea All in o e app	great idea e app
1421	a2a7be3d-41ce-472c-9e1e-eca354eedd0f	Good	good
1422	af96d36d-42a1-4c8a-9e01-6ac1b2fbee5e	not able to redeem in paytm	able redeem paytm
1423	0c30ae30-d3c9-4a6d-b6b3-ff17210839f5	5 din ho gaye gift card buy kiye hoye abhi tak...	din ho gaye gift card buy kiye hoye abhi tak g...

1423 rows × 3 columns

In [91]:

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78
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In [77]:

```
tok = Tokenizer()
tok.fit_on_texts(test_data['clean_review'])
vocab_size_test = len(tok.word_index) + 1
encd_rev_test = tok.texts_to_sequences(test_data['clean_review'])
```

In [78]:
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encd_rev_test
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Out[78]:
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```

In [79]:
```
pad_rev_test= pad_sequences(encd_rev_test, maxlen=maxi+1, padding='post'
)
pad_rev_test.shape
pad_rev_test
```

Out[79]:
```
array([[  27,    1,    7, ...,    0,    0,    0],
       [ 311,  517,    0, ...,    0,    0,    0],
       [   1,   52,    7, ...,    0,    0,    0],
       ...,
       [   2,    0,    0, ...,    0,    0,    0],
       [  81,  364,   80, ...,    0,    0,    0],
       [ 973,  172, 2082, ...,    0,    0,    0]], dtype=int32)
```

In [80]:
```
embed_dim=300
embed_matrix=np.zeros(shape=(vocab_size_test,embed_dim))
for word,i in tok.word_index.items():
  embed_vector=word_vec_dict_test.get(word)
  if embed_vector is not None:  # word is in the vocabulary learned by t
he w2v model
    embed_matrix[i]=embed_vector
```

In [81]:
```
embed_matrix
```

Out[81]:
```
array([[ 0.        ,  0.        ,  0.        , ...,  0.        ,
         0.        ,  0.        ],
       [-0.13181113,  0.11623041,  0.15446755, ..., -0.0275508 ,
         0.03693837, -0.21094216],
       [-0.07372817,  0.06590481,  0.08750626, ..., -0.01545306,
         0.02096581, -0.11538977],
       ...,
       [-0.01245232,  0.01161175,  0.01494789, ..., -0.0027527 ,
         0.00369561, -0.02201688],
       [-0.01364281,  0.01200881,  0.01430132, ..., -0.00350402,
         0.0049787 , -0.02204431],
       [-0.00660088,  0.00770116,  0.00984282, ..., -0.00275987,
         0.00134301, -0.01244323]])
```

In [82]:
```
pad_rev_test
```

Out[82]:
```
array([[  27,    1,    7, ...,    0,    0,    0],
       [ 311,  517,    0, ...,    0,    0,    0],
       [   1,   52,    7, ...,    0,    0,    0],
       ...,
       [   2,    0,    0, ...,    0,    0,    0],
       [  81,  364,   80, ...,    0,    0,    0],
       [ 973,  172, 2082, ...,    0,    0,    0]], dtype=int32)
```

In [83]:
```
x=model.predict(pad_rev_test)
```

In [89]:
```
pred=np.argmax(x,axis=1)
pred.size
```

Out[89]:
```
1423
```

In [90]:
```
pred
```

Out[90]:
```
array([1, 5, 1, ..., 1, 5, 1])
```

In [87]:

Out[87]:
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In [91]:

In [92]:

Out[92]: 906

In [93]:

Out[93]: 0

In [91]:

Out[91]: 0

In [97]:
```
out = pd.DataFrame(list(zip(test_data['id'],pred)),
                   columns =['id', 'rating'])
```

In [98]:
```
out
```

Out[98]:

	id	rating
0	bdcb3129-afc1-4608-825f-558fe9c17e2b	1
1	7518d5c8-5e35-45e2-b29d-cf0996ba9e2f	5
2	b21ca913-ba44-471b-91e1-aaf035379a84	1
3	beaaa17d-44af-44c8-ba38-24ba54c3b17d	5
4	89d8c4f0-6fe0-4389-b1f8-913ba894c0f1	1
5	16e57197-186e-44ef-ac4c-6f6a13e787ee	5
6	04a33480-0544-433d-af9d-e8c0777cadfb	1
7	5a5b705a-e3d8-4424-989c-05d078b6a461	5
8	00aad18b-1960-464c-9334-0961a9f1d65c	1
9	ce2a2f18-bfba-4430-afc5-be587a190d77	1
10	3a2abaa4-42c2-4df4-840d-52ac21f296d6	1
11	4db50ec7-89de-4765-b324-b1ef02afe7e8	1
12	0c64ee57-c3d7-4dcf-bc46-351e5832f5ff	1
13	c94b633c-db13-4723-8192-4010e331bf0c	5
14	694c834c-4711-4815-bac1-fbab70deb701	1
15	6e8187ff-9601-4327-b33d-83cc79d8745b	5
16	cf3ce256-7de3-4691-ac71-12801b0a96bb	5
17	6cbca408-e7d6-42be-aaec-bf0aec416325	5
18	f4823dc4-d588-43db-942a-8defa02d311b	1
19	e08a6211-f8a2-413f-868a-852211bad6d3	5
20	ff2f78a0-06aa-4c5f-8a42-34db98dcb6c9	1
21	b348b36e-0634-42ca-813b-d3cf49ab3dd9	1
22	9513b19e-8080-433b-a48b-48661bc7e44c	1
23	ecde28f3-5645-40cc-981f-efe91271197a	1
24	f2f45f08-3ec2-42a2-a272-2ae0501a9c65	5
25	6c728985-aeac-462c-9bbb-1c6b310c36a5	1
26	4fe0b7a3-3d8c-42d2-bc3d-802617b7388e	1
27	c16572a1-6d65-4ace-9e03-eccb2351b03e	1
28	4bfbb4ff-d4d7-4486-9848-a8c5bfd908af	5
29	0205efb9-26f7-45e2-9166-098b0a25176e	1
...	...	...
1393	1dc4365c-e6cc-4f73-beeb-d5ac95817b61	5
1394	8f9e10f7-d197-4ca6-a1e3-5229aa20f881	1
1395	43304e71-fccc-4910-b6f1-3ae3bb0fc4a6	1

	id	rating
1396	14c418aa-1c4b-465f-b518-cab34e41e609	1
1397	ce8ed196-2d0e-4324-a210-673a8ab00aa2	5
1398	d21a8c03-e1f8-432a-b214-08c016210de6	1
1399	17625bb1-1359-43ad-80b7-275d6b6a549e	5
1400	5f5c2196-4a7c-465f-a91a-be760fe57ed5	1
1401	cf84eb75-882e-4b55-9075-47de487f6af5	1
1402	79bc13bd-dd37-40ac-a54d-268c8901ae95	5
1403	9d004708-b1ab-4d7c-8350-7c46e1b5d4b3	1
1404	33844910-88a2-4d72-ad36-540372ba3a58	1
1405	ab56e9e3-2e9f-48be-9353-c2a33a1674f3	1
1406	ad7126d8-fc52-40fa-930c-61668abf009a	1
1407	70e80829-30bc-4d0c-87f3-a64a478e7a8a	1
1408	4abc7ba3-70cc-44e7-be72-88e3c96ee98d	1
1409	18bf477d-ee05-4141-9e88-5b557c423401	1
1410	2aeb0113-6f96-44c6-87d1-98edef59374d	1
1411	88ddeb5e-81d8-41a2-ad5d-a03084971c96	1
1412	33464858-480e-495f-a367-f56db6094998	5
1413	c7028857-e2d6-4350-a014-0f5ff50b4d20	1
1414	33c73fb0-3bbf-4b3d-836d-86bf8ef469ca	5
1415	27eaac02-3442-45fb-8c3b-5dfacc8cd25d	1
1416	91f08e60-7c79-4dd3-b358-4fa97ee07b7d	1
1417	aa7300e7-1bdf-4dba-91aa-aa34c99ba8d9	1
1418	6f1ab3b4-3bc0-4b8f-bb1f-2242c7d971d1	1
1419	c1043055-6240-48bc-8bbe-399a83c58d96	5
1420	a2a7be3d-41ce-472c-9e1e-eca354eedd0f	1
1421	af96d36d-42a1-4c8a-9e01-6ac1b2fbee5e	5
1422	0c30ae30-d3c9-4a6d-b6b3-ff17210839f5	1

1423 rows × 2 columns

In [102]:
```
export_csv = df.to_csv (r'\Users\shubhamkumar\submission2.csv', index = None, header=True)
```

In [101]:

In [108]:

In [109]:

In [ ]: