

Filtering Mails as Spam or Ham

In []:

```
import pandas as pd
```

In [13]:

```
#Loading Dataset
df=pd.read_csv("/Users/nisha/Downloads/spam 3.csv",encoding='latin-1')
```

In [14]:

```
df.head()
```

Out[14]:

	v1	v2	Unnamed: 2	Unnamed: 3	Unnamed: 4
0	ham	Go until jurong point, crazy.. Available only ...	NaN	NaN	NaN
1	ham	Ok lar... Joking wif u oni...	NaN	NaN	NaN
2	spam	Free entry in 2 a wkly comp to win FA Cup fina...	NaN	NaN	NaN
3	ham	U dun say so early hor... U c already then say...	NaN	NaN	NaN
4	ham	Nah I don't think he goes to usf, he lives aro...	NaN	NaN	NaN

In [15]:

```
#dropping nul value columns
df.drop(['Unnamed: 2', 'Unnamed: 3', 'Unnamed: 4'],axis=1,inplace=True)
```

In [16]:

```
df.head()
```

Out[16]:

	v1	v2
0	ham	Go until jurong point, crazy.. Available only ...
1	ham	Ok lar... Joking wif u oni...
2	spam	Free entry in 2 a wkly comp to win FA Cup fina...
3	ham	U dun say so early hor... U c already then say...
4	ham	Nah I don't think he goes to usf, he lives aro...

In [17]:

```
#renaming columns
df.rename(columns={'v1': 'labels', 'v2': 'message'},inplace=True)
```

In [18]:

```
df.head()
```

Out[18]:

	labels	message
0	ham	Go until jurong point, crazy.. Available only ...
1	ham	Ok lar... Joking wif u oni...
2	spam	Free entry in 2 a wkly comp to win FA Cup fina...
3	ham	U dun say so early hor... U c already then say...
4	ham	Nah I don't think he goes to usf, he lives aro...

In [19]:

```
#Null value assessment

df.isnull().sum()
```

Out[19]:

```
labels      0
message     0
dtype: int64
```

In [20]:

```
df['message'][1]
```

Out[20]:

```
'Ok lar... Joking wif u oni...'
```

In [21]:

```
#Function to clean the messages from special characters and hyperlinks

import re
import string
def cleaner(text):
    text=text.lower()
    text=re.sub(r'https?:\/\/\/\S+', "",text)
    text=re.sub('[%s]' % re.escape(string.punctuation), '',text)
    # text=re.sub('\[. *? \]', "",text)
    text = re.sub('<.*?>+', '', text)
    text = re.sub('\n', '', text)
    text = re.sub('\w*\d\w*', '', text)
    text=re.sub(r'@[A-Za-z0-9]+', '',text)
    text=re.sub('#', "",text)
    return text
```

In [22]:

```
#applying the function on DF

df['message']=df['message'].apply(cleaner)
```

In [23]:

```
df.head()
```

Out[23]:

	labels	message
0	ham	go until jurong point crazy available only in ...
1	ham	ok lar joking wif u oni
2	spam	free entry in a wkly comp to win fa cup final...
3	ham	u dun say so early hor u c already then say
4	ham	nah i dont think he goes to usf he lives aroun...

In [24]:

```
#Performing Stemming
from nltk.stem.porter import PorterStemmer
import nltk
nltk.download('stopwords')
from nltk.corpus import stopwords
porter=PorterStemmer()
```

```
[nltk_data] Downloading package stopwords to /Users/nisha/nltk_dat
a...
[nltk_data] Package stopwords is already up-to-date!
```

In [25]:

```
corpus=[]
for i in range(0,len(df)):
    review=df['message'][i]
    review=review.lower()
    review=review.split()
    review=[porter.stem(w) for w in review if not w in stopwords.words('english')]
    review=" ".join(review)
    corpus.append(review)
```

In [26]:

```
print(corpus[:5])
```

```
['go jurong point crazi avail bugi n great world la e buffet cine go
t amor wat', 'ok lar joke wif u oni', 'free entri wkli comp win fa c
up final tkt may text fa receiv entri questionstd txt ratetc appli',
'u dun say earli hor u c already say', 'nah dont think goe usf live
around though']
```

In [27]:

```
#Bag of words limiting the features to 5000 only
from sklearn.feature_extraction.text import CountVectorizer
cv=CountVectorizer(max_features=5000,stop_words='english')
X=cv.fit_transform(corpus).toarray()
```

In [28]:

```
vec=cv.fit(corpus)
```

In [29]:

```
y=pd.get_dummies(df['labels'])
```

In [30]:

```
y.head()
```

Out[30]:

	ham	spam
0	1	0
1	1	0
2	0	1
3	1	0
4	1	0

In [31]:

```
y=y.iloc[:,1].values
```

In [32]:

```
y[:10]
```

Out[32]:

```
array([0, 0, 1, 0, 0, 1, 0, 0, 1, 1], dtype=uint8)
```

In [33]:

```
#splitting data

from sklearn.model_selection import train_test_split
X_train,X_test,y_train,y_test=train_test_split(X,y,test_size=0.3,random_state=0)
```

In [34]:

```
#applying naive Bayes
from sklearn.naive_bayes import MultinomialNB
```

In [35]:

```
modelling=MultinomialNB().fit(X_train,y_train)
```

In [36]:

```
y_pred=modelling.predict(X_test)
```

In [37]:

```
y_pred[:10]
```

Out[37]:

```
array([0, 0, 0, 0, 0, 0, 1, 0, 0, 0], dtype=uint8)
```

In [38]:

```
from sklearn.metrics import confusion_matrix  
from sklearn.metrics import accuracy_score
```

In [39]:

```
#Confusion Matrix  
print(confusion_matrix(y_test,y_pred))
```

```
[[1402   32]  
 [  15 223]]
```

In [40]:

```
#printing accuracy  
print("Accuracy: ", accuracy_score(y_test,y_pred))
```

```
Accuracy:  0.97188995215311
```

In [41]:

```
print(vec.get_feature_names())
```

['aa', 'aah', 'aathilov', 'aathiwher', 'abi', 'abil', 'abiola', 'ab
j', 'abl', 'abt', 'abta', 'aburo', 'abus', 'ac', 'academ', 'acc', 'a
ccept', 'access', 'accid', 'accident', 'accomod', 'accordingli', 'ac
count', 'ach', 'act', 'action', 'activ', 'actor', 'actual', 'ad', 'a
dam', 'add', 'addamsfa', 'addi', 'addict', 'address', 'admin', 'admi
nistr', 'admir', 'ador', 'adult', 'advanc', 'adventur', 'advic', 'ad
vis', 'aeronaut', 'aeroplan', 'affair', 'affect', 'affection', 'afra
id', 'aft', 'afternoon', 'aftr', 'ag', 'agalla', 'age', 'agent', 'ag
o', 'agre', 'ah', 'aha', 'ahead', 'ahmad', 'ahsen', 'aid', 'aight',
'aint', 'air', 'airport', 'airtel', 'aiya', 'aiyah', 'aiyar', 'aiy
o', 'aka', 'al', 'alaipayuth', 'album', 'alcohol', 'alert', 'alex',
'alfi', 'algarv', 'aliv', 'allah', 'allow', 'alon', 'alreadi', 'alri
ght', 'alrit', 'alway', 'alwi', 'amaz', 'american', 'ami', 'amp', 'a
mt', 'amus', 'andr', 'andro', 'angri', 'anim', 'anna', 'anni', 'anni
versari', 'announc', 'annoy', 'anot', 'anoth', 'ansr', 'answer', 'an
thoni', 'anti', 'anybodi', 'anymor', 'anyon', 'anyth', 'anythin', 'a
nytim', 'anywher', 'aom', 'apart', 'apolog', 'apologis', 'app', 'app
ar', 'applebe', 'appli', 'applic', 'appoint', 'appreci', 'approach',
'approv', 'approx', 'appt', 'april', 'aproach', 'ar', 'arcad', 'ar
d', 'area', 'arent', 'argh', 'argu', 'argument', 'ari', 'aris', 'ari
thmet', 'arm', 'armand', 'armenia', 'arng', 'arngd', 'arnt', 'around
n', 'arpraveesh', 'arr', 'arrang', 'arrest', 'arriv', 'arrow', 'arse
n', 'art', 'arti', 'artist', 'arul', 'arun', 'asa', 'asap', 'asapo
k', 'asda', 'ash', 'ashley', 'ashwini', 'asia', 'asian', 'ask', 'ask
d', 'askin', 'aslamalaikkuminsha', 'asleep', 'aspect', 'ass', 'asses
s', 'asshol', 'assist', 'associ', 'assum', 'asther', 'asthma', 'ast
n', 'astoundingli', 'astrolog', 'astronom', 'asu', 'ate', 'athlet',
'athom', 'atlanta', 'atlast', 'atleast', 'atm', 'atroci', 'attach',
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t', 'attractioni', 'attribut', 'atyour', 'auction', 'auctionpunj',
'audiit', 'audit', 'audrey', 'audri', 'august', 'aunt', 'aunti', 'au
st', 'australia', 'authoris', 'auto', 'autocorrect', 'av', 'ava', 'a
vail', 'availa', 'availablei', 'availablethey', 'avalarr', 'avatar',
'avbl', 'ave', 'aveng', 'avent', 'avenu', 'avin', 'avo', 'avoid', 'a
wait', 'awak', 'award', 'away', 'awesom', 'awkward', 'aww', 'awww',
'ax', 'axi', 'ay', 'ayn', 'ayo', 'aå', 'ba', 'baaaaaaaab', 'baaaaa
b', 'babe', 'babesozi', 'babi', 'babygoodby', 'babysit', 'bad', 'ba
g', 'bagi', 'bahama', 'bak', 'balanc', 'ball', 'bang', 'bank', 'ba
r', 'bare', 'base', 'basic', 'basketbal', 'basqihav', 'bat', 'batc
h', 'batchlor', 'bath', 'bathroom', 'batsman', 'batt', 'batteri', 'b
awl', 'bay', 'bb', 'bbc', 'bbdelux', 'bbdpooja', 'bbdtht', 'bbblue',
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n', 'believ', 'beliv', 'bell', 'belli', 'belong', 'belov', 'belovd',
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d', 'bloomberg', 'bloombergcom', 'blow', 'blu', 'blue', 'bluetooth',
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e', 'caken', 'cal', 'calcul', 'cali', 'calicut', 'california', 'call
back', 'callcost', 'callcoz', 'call  ', 'caller', 'callertun', 'callf
reefon', 'callin', 'callsmessagesmiss', 'calls  ', 'calm', 'cam', 'ca
mcord', 'came', 'camera', 'cameravideo', 'campu', 'canada', 'canal',
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f', 'clock', 'close', 'closedinclud', 'closer', 'cloth', 'club', 'c
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r', 'coveragd', 'coz', 'cozi', 'cozsomtim', 'cp', 'cr', 'crab', 'cra
ck', 'craigslist', 'cram', 'cramp', 'crap', 'crash', 'crave', 'craz
i', 'craziest', 'crazyin', 'cream', 'creat', 'creativ', 'cred', 'cre
dit', 'creep', 'creepi', 'cresubi', 'cri', 'cribb', 'cricket', 'cric
kit', 'crisi', 'crisisspk', 'crore', 'cross', 'crowd', 'croydon', 'c
rucial', 'crucifi', 'cruis', 'cruisin', 'crush', 'cs', 'cst', 'cstor
e', 'ctagg', 'ctargg', 'cthen', 'ctla', 'cttargg', 'ctter', 'ctterg
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ri', 'curtsey', 'cust', 'custcar', 'custom', 'customercar', 'custome
rsqueriesnetvisionukcom', 'cut', 'cute', 'cutefrnd', 'cutest', 'cut
i', 'cutter', 'cuz', 'cya', 'cyclist', 'cyst', 'da', 'daal', 'daalwa
y', 'dabbl', 'dabook', 'dad', 'daddi', 'dado', 'dagood', 'dahe', 'da
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'danc', 'dancc', 'dancin', 'dane', 'dang', 'danger', 'dao', 'daplea
s', 'dare', 'dark', 'darker', 'darkest', 'darl', 'darlin', 'darlini
m', 'darren', 'dartboard', 'dasara', 'dat', 'data', 'date', 'dating
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ecis', 'deck', 'declar', 'decor', 'dedic', 'deduct', 'deep', 'deepa
k', 'deepest', 'deer', 'deeraj', 'def', 'defeat', 'defer', 'defini
t', 'definitli', 'defo', 'degre', 'dehydr', 'del', 'delay', 'delet',
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s', 'dept', 'der', 'derek', 'derp', 'describ', 'descript', 'desert',
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i', 'dha', 'dhina', 'dhoni', 'dhort', 'di', 'dial', 'diall', 'dialog
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i', 'didn', 'didnt', 'didntgiv', 'didnåt', 'didt', 'die', 'diesel',
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t', 'dip', 'dippeditinadew', 'direct', 'directli', 'director', 'dir
t', 'dirty', 'dirtiest', 'disagre', 'disappear', 'disappoint', 'disa
st', 'disastr', 'disc', 'disclos', 'disconnect', 'discount', 'discre
et', 'discuss', 'diseas', 'diskyou', 'dislik', 'dismay', 'dismissi',
'display', 'distanc', 'distract', 'disturb', 'disturbancemight', 'di
tto', 'divert', 'divis', 'divorc', 'diwali', 'dizzamn', 'dizze', 'd
l', 'dled', 'dlf', 'dload', 'dnt', 'dob', 'dobbi', 'doc', 'dock', 'd
octor', 'document', 'dodda', 'dodgey', 'doesdiscountshitinnit', 'doe
sn', 'doesnt', 'doesnåt', 'dog', 'dogbreath', 'dogg', 'doggi', 'dog
gin', 'dogwood', 'doin', 'doinat', 'doinghow', 'doingwhat', 'dointer
est', 'doke', 'dokey', 'doll', 'dollar', 'dolld', 'dom', 'domain',
'don', 'donat', 'donew', 'donno', 'dont', 'dontcha', 'donyt', 'donå
t', 'doom', 'door', 'dorm', 'dormitori', 'dorothykiebercom', 'dose',
'dosometh', 'dot', 'doubl', 'doublefaggot', 'doublemin', 'doubletx
t', 'doubt', 'doug', 'dough', 'download', 'downon', 'downstem', 'doz
en', 'dp', 'dr', 'dracula', 'drama', 'dramastorm', 'dramat', 'drasti
c', 'draw', 'drawpleas', 'dread', 'dream', 'dreamlov', 'dreamsmuah',
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'drinkpa', 'drive', 'driver', 'drivin', 'drizl', 'drm', 'drmstake',
'drop', 'drove', 'drpd', 'drug', 'drugdeal', 'drum', 'drunk', 'drunk
ard', 'drunken', 'drvgsto', 'dryer', 'dsnt', 'dt', 'dual', 'dub', 'd
ubsack', 'duchess', 'duck', 'dude', 'dudett', 'duffer', 'dull', 'dum
b', 'dump', 'dun', 'dungere', 'dunno', 'duo', 'durban', 'durham', 'd
usk', 'dust', 'duvet', 'dvd', 'dvg', 'dwn', 'dysentri', 'eachoth',
'ear', 'earli', 'earlier', 'earlierw', 'earliest', 'earn', 'earth',
'earthsofa', 'easi', 'easier', 'easiest', 'easili', 'east', 'easten
d', 'easter', 'eat', 'eaten', 'eatin', 'ebay', 'echo', 'eckankar',
'ecstaci', 'ecstasi', 'edg', 'edha', 'edison', 'edit', 'edrun', 'ed
uc', 'edukkukaye', 'edward', 'ee', 'eek', 'eeri', 'eerulli', 'effec
t', 'effici', 'efreefon', 'egbon', 'egg', 'eggpotato', 'eggspert',
'ego', 'eh', 'eighth', 'eightish', 'eir', 'el', 'ela', 'elabor', 'el
ain', 'elama', 'elaya', 'eldest', 'elect', 'electr', 'eleph', 'ellio
t', 'ello', 'els', 'elsewher', 'elvi', 'em', 'email', 'embarass', 'e
mbarrass', 'embassi', 'emerg', 'emigr', 'emili', 'emot', 'employ',
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nglish', 'enjoy', 'enjoyin', 'enketa', 'enna', 'ennal', 'enter', 'en
tertain', 'entey', 'entir', 'entitl', 'entrepreneur', 'entri', 'entr
op', 'enufcredeit', 'enuff', 'envelop', 'envi', 'epi', 'epsilon', 'e
qual', 'er', 'ericson', 'ericsson', 'erm', 'erot', 'err', 'error',
'ertini', 'eruku', 'erupt', 'erutupalam', 'eryth', 'esaplanad', 'esc
al', 'escap', 'ese', 'eshxxxxxxxxxxxx', 'especi', 'espel', 'esplana
d', 'essay', 'essenti', 'establish', 'eta', 'etern', 'ethnic', 'ethr
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e', 'eveb', 'evei', 'event', 'eventu', 'everi', 'everybodi', 'everyb

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o', 'sef', 'seh', 'sehwag', 'select', 'self', 'selfindepend', 'selfi
sh', 'selfless', 'sell', 'sem', 'semest', 'semi', 'semiobscur', 'se
n', 'send', 'sender', 'sendernam', 'senor', 'senrddnot', 'sens', 'se
nsesrespect', 'sensibl', 'sensit', 'sent', 'sentdat', 'sentenc', 'se
nthil', 'senthilhsbc', 'seperated', 'sept', 'septemb', 'serena', 'se
ri', 'seriou', 'serv', 'server', 'servic', 'set', 'settl', 'seven',
'seventeen', 'sever', 'sex', 'sexi', 'sexiest', 'sextextukcom', 'sex
ual', 'seychat', 'sez', 'sf', 'sfine', 'sfirst', 'sfrom', 'sh', 'sh
a', 'shade', 'shadow', 'shag', 'shah', 'shahjahan', 'shakara', 'shak
e', 'shakespear', 'shall', 'shame', 'shampain', 'shangela', 'shangha
i', 'shanilrakhesh', 'shant', 'shape', 'share', 'shatter', 'shave',
'shb', 'shd', 'sheet', 'sheffield', 'shelf', 'shell', 'shelv', 'sher
awat', 'shesil', 'shhhhh', 'shi', 'shifad', 'shija', 'shijutta', 'sh
inco', 'shindig', 'shine', 'shini', 'ship', 'shirt', 'shit', 'shit
e', 'shitin', 'shitjustfound', 'shitload', 'shitstorm', 'shivratri',
'shja', 'shld', 'shldxxxx', 'shock', 'shoe', 'shola', 'shoot', 'sho
p', 'shoppin', 'shopth', 'shopw', 'shoranur', 'shore', 'shoreth', 's
hort', 'shortag', 'shortcod', 'shorter', 'shortli', 'shot', 'shoul',
'shoulder', 'shouldn', 'shouldnt', 'shout', 'shove', 'shower', 'show
r', 'showroomsc', 'shrek', 'shrink', 'shrub', 'shu', 'shud', 'shuhu
i', 'shun', 'shut', 'si', 'sian', 'sib', 'sic', 'sick', 'sicom', 's
if', 'sigh', 'sight', 'sign', 'signal', 'signific', 'signin', 'siguv
iri', 'silenc', 'silent', 'silli', 'silver', 'sim', 'simpl', 'simple
r', 'simpli', 'simpson', 'simul', 'sinc', 'sinco', 'sindu', 'sing',
'singapor', 'singl', 'sink', 'sip', 'sipix', 'sir', 'siri', 'sirji
i', 'sirsalam', 'sister', 'sit', 'site', 'sitll', 'sitter', 'sitti
n', 'situat', 'siva', 'sivatat', 'size', 'skalli', 'skateboard', 'sk
ilgm', 'skill', 'skillgam', 'skin', 'skinni', 'skint', 'skip', 'skir

t', 'sky', 'skye', 'skype', 'skyve', 'slaaaaav', 'slack', 'slap', 'slave', 'sleep', 'sleepi', 'sleepin', 'sleepingand', 'sleepingwith', 'sleepsweet', 'sleepwellamptak', 'slept', 'slice', 'slide', 'slightli', 'slip', 'slipper', 'slipperi', 'slo', 'slob', 'slot', 'slove', 'slow', 'slower', 'slowli', 'slurp', 'sm', 'smack', 'small', 'smaller', 'smart', 'smartcal', 'smarter', 'smarthtthough', 'smash', 'smear', 'smell', 'smeon', 'smidgin', 'smile', 'smiley', 'smith', 'smithswitc', 'smoke', 'smokin', 'smoothli', 'smsd', 'smsing', 'smsservic', 'smsshsexnetun', 'smth', 'sn', 'snake', 'snap', 'snappi', 'snatch', 'snd', 'sneham', 'snicker', 'sno', 'snog', 'snoringthey', 'snow', 'snowbal', 'snowboard', 'snowman', 'snuggl', 'soani', 'soc', 'socht', 'social', 'sofa', 'soft', 'softwar', 'soil', 'soire', 'sol', 'soladh', 'sold', 'solihul', 'solv', 'somebodi', 'someday', 'someone', 'someonethat', 'someonon', 'someplac', 'somerset', 'someth', 'somethin', 'sometim', 'sometimerakheshvisitor', 'sometm', 'somewhat', 'somewhere', 'somewheresomeon', 'somewhr', 'somon', 'sontim', 'sonathaya', 'sonetim', 'song', 'soni', 'sonot', 'sonyericsson', 'soo', 'soon', 'soonc', 'sooner', 'soonlot', 'soonxxx', 'sooo', 'soooo', 'sooooo', 'sopha', 'sore', 'sori', 'sorri', 'sorrow', 'sorrowsi', 'sorryi', 'soryin', 'sort', 'sorta', 'sortedbut', 'sorydarealyfrm', 'soso', 'soul', 'sound', 'soundtrack', 'soup', 'sourc', 'south', 'southern', 'souveni', 'soz', 'sp', 'space', 'spacebuck', 'spageddi', 'spain', 'spam', 'spanish', 'spare', 'spark', 'sparkl', 'spatula', 'speak', 'spec', 'special', 'specialcal', 'specialis', 'specif', 'specifi', 'speechless', 'speed', 'speedchat', 'spele', 'spell', 'spend', 'spent', 'spi', 'spice', 'spider', 'spiderman', 'spif', 'spile', 'spin', 'spinout', 'spiral', 'spirit', 'spiritu', 'spjanuari', 'spk', 'spl', 'splash', 'splashmobil', 'splat', 'splendid', 'split', 'splle', 'splwat', 'spoil', 'spoilt', 'spoke', 'spoken', 'sponsor', 'spontan', 'spook', 'spoon', 'sporad', 'sport', 'sportsx', 'spose', 'spot', 'spotti', 'spous', 'sppok', 'spreadsheet', 'spree', 'spring', 'sprint', 'sprwm', 'sptv', 'sptyron', 'spunout', 'squat', 'squeeeeee', 'squeeze', 'squid', 'squishi', 'sr', 'sri', 'srsli', 'srt', 'ssi', 'ssindia', 'ssnervou', 'st', 'stabil', 'stabl', 'stadium', 'staff', 'stage', 'stagwood', 'stair', 'stalk', 'stamp', 'stand', 'standard', 'stapati', 'star', 'stare', 'starer', 'starshin', 'start', 'startedindia', 'starti', 'starv', 'stash', 'state', 'statement', 'station', 'statu', 'stay', 'stayin', 'std', 'stdtxtrate', 'steak', 'steal', 'steam', 'steamboat', 'steed', 'steer', 'step', 'stereo', 'stereophon', 'sterl', 'stern', 'steve', 'stevelik', 'stewarts', 'steyn', 'sth', 'sthi', 'stick', 'sticki', 'stifl', 'stil', 'stillmayb', 'stink', 'stitch', 'stock', 'stockport', 'stolen', 'stomach', 'stomp', 'stone', 'stoner', 'stool', 'stop', 'stopbcm', 'stopc', 'stopcost', 'stoptxt', 'stoptxtstop', 'stoptxtstopå', 'store', 'storelik', 'stori', 'storm', 'str', 'straight', 'strain', 'strang', 'stranger', 'strangersaw', 'stream', 'street', 'streetshal', 'stress', 'stressful', 'stretch', 'strewn', 'strict', 'strike', 'string', 'strip', 'stripe', 'stroke', 'strong', 'strongbuy', 'strongli', 'strt', 'strtd', 'struggl', 'stu', 'stubborn', 'stuck', 'studdi', 'student', 'studentfinanci', 'studi', 'studio', 'studyn', 'stuf', 'stuff', 'stuffleav', 'stuffwhi', 'stun', 'stupid', 'stupidit', 'style', 'stylish', 'stylist', 'sub', 'subject', 'sublet', 'submit', 'subpoli', 'subscrib', 'subscript', 'subscrit', 'subsequ', 'subtoitl', 'success', 'suck', 'sucker', 'sudden', 'sudde', 'nli', 'sudn', 'sue', 'suffer', 'suffici', 'sugabab', 'suganya', 'sugar', 'sugardad', 'suggest', 'suit', 'suitem', 'sullivan', 'sum', 'sumf', 'summer', 'summon', 'sumthin', 'sumthinxx', 'sun', 'sunday', 'sundayish', 'sunlight', 'sunni', 'sunoco', 'sunroof', 'sunscreen', 'sunshin', 'suntec', 'sup', 'super', 'superb', 'superior', 'supervisor', 'supli', 'supos', 'suppli', 'supplier', 'support', 'supportprovid', 'supportveri', 'suppos', 'suprem', 'suprman', 'sura', 'sure', 'surf', 'surgic', 'surli', 'surnam', 'surpris', 'surrend', 'surround',

'survey', 'surya', 'sutra', 'sux', 'suzi', 'svc', 'swalpa', 'swan', 'swann', 'swap', 'swashbuckl', 'swat', 'swatch', 'sway', 'swayz', 'swear', 'sweater', 'sweatter', 'sweet', 'sweetest', 'sweetheart', 'sweeti', 'swell', 'swlrt', 'swim', 'swimsuit', 'swing', 'swiss', 'switch', 'swollen', 'swoop', 'swt', 'swtheart', 'syd', 'syllabu', 'symbol', 'sympathet', 'symptom', 'sync', 'syria', 'syrup', 'ta', 'tabl', 'tablet', 'tackl', 'taco', 'tact', 'tactless', 'tadaaaaa', 'tag', 'tahan', 'tai', 'tait', 'taj', 'taka', 'takecar', 'taken', 'takenonli', 'takin', 'talent', 'talk', 'talkbut', 'talkin', 'tall', 'tallaha', 'sse', 'tallent', 'tamilnaduthen', 'tampa', 'tank', 'tantrum', 'tap', 'tape', 'tariff', 'tarot', 'tarpon', 'tast', 'tat', 'tata', 'tattoo', 'tau', 'taught', 'taunton', 'tax', 'taxi', 'taxless', 'taxt', 'taylor', 'tayseertissco', 'tb', 'tbspersolvo', 'tc', 'tcllc', 'tcsc', 'tcsstop', 'tea', 'teach', 'teacher', 'teacoffe', 'team', 'tear', 'teas', 'tech', 'technic', 'technolog', 'tee', 'teenag', 'teeth', 'teethi', 'teethif', 'teju', 'tel', 'telephon', 'teletext', 'tell', 'telli', 'tellmiss', 'telphon', 'telugu', 'telugutht', 'temal', 'temp', 'temper', 'templ', 'tenant', 'tendenc', 'tenerif', 'tens', 'tension', 'teresa', 'term', 'terminatedw', 'termsappli', 'terri', 'terribl', 'terrif', 'terrorist', 'tesco', 'tessypl', 'test', 'tex', 'texa', 'texd', 'text', 'textand', 'textbook', 'textbuddi', 'textcomp', 'textin', 'textoper', 'textpod', 'textsweekend', 'tgxxrz', 'th', 'thandiyachu', 'thangam', 'thangamit', 'thank', 'thanksgiv', 'thanku', 'thankyou', 'thanx', 'thanxxx', 'thasa', 'thatd', 'thatdont', 'thati', 'thatll', 'thatmum', 'thatnow', 'thataå', 'thataåscool', 'theacus', 'theater', 'theatr', 'thedailydraw', 'thekingshead', 'theme', 'themob', 'themobhit', 'themobyo', 'themp', 'thenwil', 'theoret', 'theori', 'theplac', 'theredo', 'thereregoodnight', 'therel', 'therer', 'thererexx', 'theseday', 'theseyour', 'thesi', 'thesmszonecom', 'thewend', 'theyll', 'theyr', 'thgt', 'thi', 'thia', 'thing', 'thinghow', 'think', 'thinkin', 'thinkthi', 'thinl', 'thirunelvali', 'thisdon', 'thk', 'thkin', 'thm', 'thnk', 'thnq', 'thnx', 'tho', 'thoso', 'thot', 'thou', 'thought', 'thoughtsi', 'thousand', 'thout', 'thread', 'threat', 'threw', 'thriller', 'throat', 'throw', 'throwin', 'throw n', 'thrurespect', 'tht', 'thu', 'thuglyf', 'thur', 'thursday', 'thx', 'ti', 'tick', 'ticket', 'tiempo', 'tiger', 'tight', 'tightli', 'tigress', 'tih', 'tiim', 'til', 'till', 'tim', 'time', 'timedhoni', 'timehop', 'timeslil', 'timey', 'timeyour', 'timi', 'timin', 'tip', 'tire', 'tirunelvai', 'tirunelvali', 'tirupur', 'tisscotays', 'titl', 'titleso', 'tiwari', 'tix', 'tiz', 'tke', 'tkt', 'tlk', 'tm', 'tming', 'tmobil', 'tmorrowpl', 'tmr', 'tmrw', 'tmw', 'tnc', 'toa', 'toaday', 'tobacco', 'tobe', 'tocallshal', 'toclaim', 'today', 'todaybut', 'todaydo', 'todayfrom', 'todaygood', 'todayh', 'todaysundaysunday', 'todo', 'tog', 'togeth', 'tohar', 'toilet', 'tok', 'toke', 'token', 'tol', 'told', 'toldsh', 'toledo', 'toler', 'toll', 'tom', 'tomarrow', 'tomeandsaidthi', 'tomo', 'tomoc', 'tomorro', 'tomorrow', 'tomorrowcal', 'tomorrowtoday', 'tomorw', 'ton', 'tone', 'tonesrepli', 'tonex', 'tonght', 'tongu', 'tonight', 'tonit', 'tonitebusi', 'toniteth', 'took', 'tookplac', 'tool', 'toolet', 'tooo', 'tooprav', 'toot', 'toothpast', 'tootsi', 'topic', 'topicsorri', 'toplay', 'toppoli', 'tor', 'torch', 'torrent', 'tortilla', 'tortur', 'tosend', 'toshiba', 'toss', 'tot', 'total', 'tote', 'touch', 'tough', 'toughest', 'tour', 'town', 'towndontmatt', 'toxic', 'toyota', 'tp', 'track', 'trackmarqu', 'trade', 'tradit', 'traffic', 'train', 'trainner', 'tram', 'tranquil', 'transact', 'transcrib', 'transfer', 'transferacc', 'transfr', 'transport', 'trash', 'trauma', 'trav', 'travel', 'treac l', 'treadmil', 'treasur', 'treat', 'treatin', 'trebl', 'tree', 'trek', 'trend', 'tri', 'trial', 'trip', 'tripl', 'trishul', 'triumph', 'tron', 'troubl', 'troubleshoot', 'trouser', 'trubl', 'truck', 'true', 'truekdo', 'truffl', 'truli', 'truro', 'trust', 'truth', 'tryin', 'trywal', 'ts', 'tsandc', 'tsc', 'tshirt', 'tsunami', 'tt', 'tty

l', 'tue', 'tuesday', 'tui', 'tuition', 'tul', 'tulip', 'tund', 'tun
e', 'tunji', 'turkey', 'turn', 'tuth', 'tv', 'tvhe', 'tvlol', 'twa
t', 'twelv', 'twenti', 'twice', 'twigg', 'twilight', 'twin', 'twin
k', 'twitter', 'txt', 'txtauction', 'txtauctiontxt', 'txtin', 'txtin
g', 'txtjourney', 'txtno', 'txtx', 'tyler', 'type', 'typelyk', 'typi
c', 'uawakefeellikw', 'ubandu', 'ubi', 'ucal', 'ud', 'ufind', 'ugad
i', 'ugh', 'ugo', 'uh', 'uhhhhrmm', 'uif', 'uin', 'ujhhhhhhh', 'uk',
'ukmobiled', 'ull', 'ultim', 'ultimatum', 'um', 'umma', 'ummmawil',
'ummmmmaah', 'unabl', 'unbeliev', 'uncl', 'unclaim', 'uncomfort', 'u
ncondit', 'unconsci', 'unconvinc', 'uncount', 'uncut', 'underdtand',
'understand', 'understood', 'underwear', 'undrstnd', 'undrstndng',
'unemploy', 'unev', 'unfold', 'unfortun', 'unfortuntli', 'unhappi',
'uni', 'unicef', 'uniform', 'unintent', 'uniqu', 'uniquei', 'unit',
'univ', 'univers', 'unknown', 'unless', 'unlik', 'unlimit', 'unmit',
'unnecessarili', 'unni', 'unrecogn', 'unredeem', 'unsecur', 'unsol
d', 'unsoldmik', 'unsoldnow', 'unsub', 'unsubscribe', 'unusu', 'uothr
wis', 'upcharg', 'updat', 'updatenow', 'upgrad', 'upgrdcentr', 'upha
d', 'upload', 'upnot', 'upset', 'upseti', 'upsetit', 'upstair', 'upt
o', 'uptown', 'upyeh', 'ur', 'ure', 'urfeel', 'urgent', 'urgentbut',
'urgentlyit', 'urgh', 'urgnt', 'urgoin', 'urin', 'url', 'urmomi', 'u
rn', 'urself', 'usb', 'usc', 'uscedu', 'use', 'useless', 'user', 'us
f', 'usget', 'usher', 'uslet', 'usml', 'usno', 'uso', 'usp', 'usua
l', 'usualiam', 'uteru', 'utter', 'uu', 'uup', 'uv', 'uve', 'uworl
d', 'uxxxx', 'vaazhthukk', 'vagu', 'vai', 'vale', 'valentin', 'vali
d', 'valu', 'valuabl', 'valuemorn', 'varaya', 'vargu', 'vari', 'vari
ou', 'varma', 'vasai', 'vat', 'vatian', 'vava', 'vco', 'vday', 'veg
a', 'veget', 'veggi', 'vehicl', 'velacheri', 'velli', 'velusami', 'v
enaam', 'venugop', 'verifi', 'version', 'versu', 'vettam', 'vewi',
'vibrant', 'vibrat', 'vic', 'victor', 'victoria', 'vid', 'video', 'v
ideochat', 'videop', 'videophon', 'videosound', 'vidnot', 'view', 'v
ijay', 'vijaykanth', 'vikki', 'vikkyim', 'vilikkamt', 'vill', 'vill
a', 'villag', 'vinobanagar', 'violat', 'violenc', 'violet', 'vip',
'virgil', 'virgin', 'virtual', 'visa', 'visionsmscom', 'visit', 'vis
itne', 'visitor', 'vital', 'vitamin', 'viva', 'vivek', 'viveki', 'v
l', 'vldo', 'voda', 'vodafon', 'vodka', 'voic', 'voicemail', 'voil
a', 'volcano', 'vomit', 'vomitin', 'vote', 'voucher', 'voucherstex
t', 'vpist', 'vpod', 'vri', 'vs', 'vth', 'vtire', 'vu', 'wa', 'waaaa
t', 'wad', 'wadebridgei', 'wah', 'wahala', 'wahay', 'wahe', 'waheed
a', 'wahleykkumshar', 'waht', 'wait', 'waiti', 'waitin', 'waitshoul
d', 'waitu', 'wake', 'wale', 'walik', 'walk', 'walkabout', 'walkin',
'wall', 'wallet', 'wallpap', 'wallpaperal', 'walmart', 'walsal', 'wa
mma', 'wan', 'wana', 'wanna', 'wannatel', 'want', 'wap', 'waqt', 'wa
rm', 'warn', 'warner', 'warranti', 'warwick', 'washob', 'wasn', 'was
nt', 'wasnâot', 'wast', 'wat', 'watch', 'watchin', 'watchng', 'wat
e', 'water', 'watev', 'watevr', 'watll', 'watridayno', 'watt', 'wav
e', 'way', 'waythi', 'wc', 'weak', 'weapon', 'wear', 'weasel', 'weat
her', 'web', 'webadr', 'webeburnin', 'webpag', 'websit', 'websiteno
w', 'wed', 'weddin', 'weddingfriend', 'wednesday', 'wee', 'weed', 'w
eeddefici', 'week', 'weekday', 'weekend', 'weekli', 'weekstop', 'wei
gh', 'weight', 'weighthaha', 'weightloss', 'weird', 'weirdest', 'wei
rdi', 'weirdo', 'weiyi', 'welcom', 'wellda', 'welli', 'welltak', 'we
llyou', 'welp', 'wen', 'wendi', 'wenev', 'went', 'wenwecan', 'wer',
'werear', 'werebor', 'werent', 'wereth', 'wesley', 'west', 'wester
n', 'westlif', 'westonzoyland', 'westshor', 'wet', 'wetherspoon', 'w
eve', 'wewa', 'weaöov', 'whassup', 'whatev', 'whatsup', 'wheat', 'whe
el', 'wheellock', 'whenev', 'whenevr', 'whenr', 'whenwher', 'wherea
r', 'wherebtw', 'wherev', 'wherevr', 'wherr', 'whileamp', 'whillta
k', 'whisper', 'white', 'whn', 'whore', 'whr', 'wi', 'wick', 'wicke
t', 'wicklow', 'wid', 'widelivecomindex', 'wif', 'wife', 'wifedont',
'wifehow', 'wifi', 'wihtuot', 'wikipediacom', 'wil', 'wild', 'wildes
t', 'wildlif', 'willpow', 'win', 'wind', 'windi', 'window', 'wine',

'wing', 'winner', 'winnersclub', 'winterston', 'wipro', 'wipro', 'wipro', 'wisdom', 'wise', 'wish', 'wishin', 'wishlist', 'wiskey', 'wit', 'withdraw', 'wither', 'witin', 'witot', 'witout', 'wiv', 'wizzl', 'wk', 'wkend', 'wkg', 'wkli', 'wknd', 'wktxt', 'wlcome', 'wld', 'wn', 'wnevr', 'wnt', 'wo', 'woah', 'wocay', 'woke', 'woken', 'woman', 'womdarful', 'women', 'wondar', 'wondarful', 'wonder', 'wont', 'woo', 'wood', 'woodland', 'woohoo', 'woot', 'woould', 'woozl', 'worc', 'word', 'wordcollect', 'wordnot', 'wordseveri', 'wordstart', 'work', 'workag', 'workand', 'workin', 'worklov', 'workout', 'world', 'worldgnun', 'worldmay', 'worldveri', 'worm', 'worri', 'worriedx', 'worryc', 'worryus', 'wors', 'worst', 'worth', 'worthless', 'wot', 'wotu', 'wotz', 'woul', 'woulda', 'wouldnt', 'wound', 'wow', 'wquestion', 'wrc', 'wreck', 'wrench', 'wright', 'write', 'writh', 'wrk', 'wrki', 'wrkin', 'wrking', 'wrld', 'wrnog', 'wrong', 'wrongli', 'wrongtak', 'wrote', 'ws', 'wt', 'wtc', 'wtf', 'wth', 'wthout', 'wud', 'wudnt', 'wuld', 'wuldnt', 'wun', 'wwwapplausestorecom', 'wwwareyouuniquecouk', 'wwwasjesuscom', 'wwwbridalpetticoatdreamscouk', 'wwwcashbincouk', 'wwwclubmobycouk', 'wwwclubzedcouk', 'wwwcnupdatescomnewslett', 'wwwcomuknet', 'wwwdbuknet', 'wwwflirtpartyu', 'wwwfullonsmscom', 'wwwgambtv', 'wwwgetzedcouk', 'wwwidewcom', 'wwwldewcom', 'wwwmovietriviavtv', 'wwwmusictrivianet', 'wwworangecoukow', 'wwwregalportfoliocouk', 'wwwringtonekingcouk', 'wwwringtonescouk', 'wwwrtfsphostingcom', 'wwwsantacallingcom', 'wwwshortbreaksorguk', 'wwwsmsacubootydeli', 'wwwsmsacugoldvik', 'wwwsmsacuhmmross', 'wwwsmsconet', 'wwwtcbiz', 'wwwtelediscountcouk', 'wwwtextcompcom', 'wwwtextpodnet', 'wwwtklscom', 'wwwtxttowincouk', 'wyli', 'xafter', 'xam', 'xavier', 'xchat', 'xclusiveclubsaaisai', 'xin', 'xma', 'xnet', 'xoxo', 'xt', 'xuhui', 'xx', 'xxsp', 'xxuk', 'xxx', 'xxxmobilemovieclub', 'xxxmobilemovieclubcomnqjkgighj jgcb', 'xxxx', 'xxxxx', 'xxxxxx', 'xxxxxxx', 'xxxxxxx', 'xxxxxxx', 'xxxxxxx', 'xy', 'ya', 'yago', 'yah', 'yahoo', 'yalrigu', 'yalru', 'yam', 'yan', 'yar', 'yard', 'yavnt', 'yaxx', 'yaxxx', 'yay', 'yck', 'yday', 'ye', 'yeah', 'yeahand', 'year', 'yeesh', 'yeh', 'yell', 'yellow', 'yelowi', 'yen', 'yeovil', 'yep', 'yer', 'yesbut', 'yesfrom', 'yesgauti', 'yesh', 'yeshier', 'yesim', 'yesmum', 'yessura', 'yest', 'yesterday', 'yetti', 'yetund', 'yi', 'yifeng', 'yiju', 'yijuehotmailcom', 'ym', 'ymca', 'yo', 'yoga', 'yogasana', 'yoher', 'yor', 'yorg', 'youani', 'youcarlo', 'youclean', 'youd', 'youdearwith', 'youdo', 'youhow', 'youi', 'youkwher', 'yould', 'youll', 'youmi', 'youmoney', 'young', 'younger', 'youphon', 'yourinclus', 'yourjob', 'youso', 'youthat', 'youto', 'youuuuu', 'youv', 'youwanna', 'youwhen', 'youuâor', 'yovil', 'yowif', 'yoyyooo', 'yr', 'ystrdayic', 'yummi', 'yummmm', 'yun', 'yunni', 'yuo', 'yuou', 'yup', 'yupz', 'ywhere', 'zac', 'zاهر', 'zealand', 'zebra', 'zed', 'zero', 'zhong', 'zindgi', 'zoe', 'zogtoriu', 'zoom', 'zouk', 'zyada', 'âð', 'âðharri', 'âðit', 'âðmorrow', 'âðrent', 'ïll', 'ïï', 'ïïll', 'ûthank', 'ûam', 'ûat', 'ûav', 'ûï', 'ûïharri', 'ûò']

In [43]:

X[:10]

Out[43]:

```
array([[0, 0, 0, ..., 0, 0, 0],
       [0, 0, 0, ..., 0, 0, 0],
       [0, 0, 0, ..., 0, 0, 0],
       ...,
       [0, 0, 0, ..., 0, 0, 0],
       [0, 0, 0, ..., 0, 0, 0],
       [0, 0, 0, ..., 0, 0, 0]], dtype=int64)
```

In [44]:

```
vec.get_feature_names()[ :10]
```

Out[44]:

```
['aa',  
 'aah',  
 'aathilov',  
 'aathiwher',  
 'abi',  
 'abil',  
 'abiola',  
 'abj',  
 'abl',  
 'abt']
```

In [45]:

```
df1=pd.DataFrame(X[:5000],index=vec.get_feature_names()[ :5000])
```

In [46]:

```
#summation along the columns to find the importance of each word  
df1['sum']=df1.sum(axis=1)
```

In [47]:

```
df1['sum'][ :10]
```

Out[47]:

```
aa          11  
aah          5  
aathilov    17  
aathiwher    6  
abi          6  
abil        15  
abiola       6  
abj         14  
abl         13  
abt         12  
Name: sum, dtype: int64
```

In [48]:

```
df2=df1.sort_values(['sum'],ascending="True")
```

In [49]:

```
df2['sum']
```

Out[49]:

strangersaw	0
wana	0
sday	0
aiyo	0
budget	0
fromm	0
diesel	0
forå	0
ringtonefrom	0
trubl	0
eir	0
advic	0
fri	0
ennal	0
shld	0
unredeem	0
wyli	0
youd	0
trywal	0
qlynnbv	0
stillmayb	0
attractioni	0
program	0
money	0
gb	0
tui	0
floor	0
wwwbridalpetticoatdreamscouk	0
tsc	0
reffer	0
	..
twin	27
somewhat	28
jordan	28
kegger	28
forgt	29
reschedul	29
sheffield	29
real	30
laid	30
string	30
oooh	31
iscom	31
daysso	32
steve	32
updat	32
morphin	33
selfish	33
porn	33
facebook	34
fmyou	34
yelowi	36
mo	40
freemsgfeelin	48
remb	51
lect	53
punch	53
henri	54
mistak	57

```
musthu          60
dramat          62
Name: sum, Length: 5000, dtype: int64
```

In []:

```
#TFIDF
```

In []:

```
#tokenizing
```

In [50]:

```
def tokenizer_p(text):
    return [porter.stem(w) for w in text.split()]
```

In [51]:

```
from sklearn.feature_extraction.text import TfidfVectorizer
tfidf=TfidfVectorizer(strip_accents=None, lowercase=False,preprocessor=None,
                      tokenizer=tokenizer_p,use_idf=True,
                      norm='l2',smooth_idf=True)
```

In [52]:

```
X1=tfidf.fit_transform(df.message)
```

In [53]:

```
type(X1)
```

Out[53]:

```
scipy.sparse.csr.csr_matrix
```

In [54]:

```
X1_train, X1_test, y1_train, y1_test=train_test_split(X1,y,test_size=0.3,random_
state=0)
```

In [55]:

```
type(X1_test)
```

Out[55]:

```
scipy.sparse.csr.csr_matrix
```

In [56]:

```
print(X1[:10])
```

```
(0, 2308)    0.1279893290676052
(0, 6255)    0.22421039216410404
(0, 3070)    0.31822891238857515
(0, 4468)    0.21729342944200922
(0, 1251)    0.2464463867642385
(0, 402)     0.24198735006385153
(0, 4151)    0.15363563633168983
(0, 2812)    0.10513626499475971
(0, 780)     0.2688410711448906
(0, 3847)    0.1726627504612227
(0, 2393)    0.17712178716160965
(0, 6663)    0.2162607253430146
(0, 3206)    0.2688410711448906
(0, 1685)    0.18863700694241692
(0, 778)     0.3037838948290126
(0, 1040)    0.2688410711448906
(0, 5903)    0.15294047677674996
(0, 2358)    0.14949806876101196
(0, 210)     0.31822891238857515
(0, 6460)    0.17678409935536454
(1, 4116)    0.27688324362563543
(1, 3238)    0.41207318189732706
(1, 3036)    0.46742635237301533
(1, 6579)    0.4355907679554564
(1, 6184)    0.2024772238069804
:           :
(8, 832)     0.12361326053272054
(8, 1093)    0.23606829748806687
(8, 6321)    0.24582615727704726
(8, 2688)    0.21634708466655145
(9, 6184)    0.09917198170641212
(9, 2133)    0.2837707045514668
(9, 6007)    0.14828537392787988
(9, 2091)    0.10772103821875745
(9, 6610)    0.12708969458852007
(9, 6846)    0.10587008727089235
(9, 832)     0.10927865500464669
(9, 2457)    0.16955673108486388
(9, 3726)    0.47881783742630957
(9, 3756)    0.20010181674761285
(9, 4183)    0.12300195245498662
(9, 3764)    0.16789603661658134
(9, 4706)    0.1586071977942229
(9, 1790)    0.25037846099179
(9, 6260)    0.44692907213173944
(9, 5885)    0.18155287325499703
(9, 3253)    0.20095516053704102
(9, 1110)    0.2173193370713303
(9, 851)     0.20658576511917473
(9, 1082)    0.17632039292316834
(9, 4140)    0.11592863957060065
```

In [57]:

```
#applying Logistic Regression
from sklearn.linear_model import LogisticRegressionCV
```

In [62]:

```
clf=LogisticRegressionCV(cv=6,scoring='accuracy', random_state=0, n_jobs=-1,  
                           verbose=3, max_iter=300).fit(X1_train,y1_train)
```

```
[Parallel(n_jobs=-1)]: Using backend LokyBackend with 4 concurrent w  
orkers.
```

```
[Parallel(n_jobs=-1)]: Done    2 out of    6 | elapsed:    6.5s remain  
ing:    13.0s
```

```
[Parallel(n_jobs=-1)]: Done    6 out of    6 | elapsed:    7.7s finish  
ed
```

In [59]:

```
X1_test.shape
```

Out[59]:

```
(1672, 6905)
```

In [63]:

```
y_pred=clf.predict(X1_test)
```

In [65]:

```
#Accuracy of model  
print(accuracy_score(y_test,y_pred))
```

```
0.9814593301435407
```