Fake News Classifier

```
In [1]:
```

```
import pandas as pd
```

In [2]:

```
#Read the data
df=pd.read_csv('D:/Fake-news/train/train.csv')
```

In [4]:

```
df.head(9)
```

Out[4]:

	id	title	author	text	label
0	0	House Dem Aide: We Didn't Even See Comey's Let	Darrell Lucus	House Dem Aide: We Didn't Even See Comey's Let	1
1	1	FLYNN: Hillary Clinton, Big Woman on Campus	Daniel J. Flynn	Ever get the feeling your life circles the rou	0
2	2	Why the Truth Might Get You Fired	Consortiumnews.com	Why the Truth Might Get You Fired October 29,	1
3	3	15 Civilians Killed In Single US Airstrike Hav	Jessica Purkiss	Videos 15 Civilians Killed In Single US Airstr	1
4	4	Iranian woman jailed for fictional unpublished	Howard Portnoy	Print \nAn Iranian woman has been sentenced to	1
5	5	Jackie Mason: Hollywood Would Love Trump if He	Daniel Nussbaum	In these trying times, Jackie Mason is the Voi	0
6	6	Life: Life Of Luxury: Elton John's 6 Favorite	NaN	Ever wonder how Britain's most iconic pop pian	1
7	7	Benoît Hamon Wins French Socialist Party's Pre	Alissa J. Rubin	PARIS — France chose an idealistic, traditi	0
8	8	Excerpts From a Draft Script for Donald Trump'	NaN	Donald J. Trump is scheduled to make a highly	0

In [8]:

```
## Get the Independent Features
X=df.drop('label',axis=1)
```

In [9]:

X.head()

Out[9]:

	id	title	author	text
0	0	House Dem Aide: We Didn't Even See Comey's Let	Darrell Lucus	House Dem Aide: We Didn't Even See Comey's Let
1	1	FLYNN: Hillary Clinton, Big Woman on Campus	Daniel J. Flynn	Ever get the feeling your life circles the rou
2	2	Why the Truth Might Get You Fired	Consortiumnews.com	Why the Truth Might Get You Fired October 29, \dots
3	3	15 Civilians Killed In Single US Airstrike Hav	Jessica Purkiss	Videos 15 Civilians Killed In Single US Airstr
4	4	Iranian woman jailed for fictional unpublished	Howard Portnoy	Print \nAn Iranian woman has been sentenced to

In [10]:

```
## Get the Dependent features
y=df['label']
```

In [11]:

```
y.head()
```

Out[11]:

```
0 1
1 0
2 1
3 1
4 1
```

Name: label, dtype: int64

```
Out[12]:
(20800, 5)
In [13]:
from sklearn.feature_extraction.text import CountVectorizer, TfidfVectorizer

In [14]:
df=df.dropna()

In [15]:
df.shape
Out[15]:
(18285, 5)
In [16]:
df.head(10)
Out[16]:
```

	id	title	author	text	label
0	0	House Dem Aide: We Didn't Even See Comey's Let	Darrell Lucus	House Dem Aide: We Didn't Even See Comey's Let	1
1	1	FLYNN: Hillary Clinton, Big Woman on Campus	Daniel J. Flynn	Ever get the feeling your life circles the rou	0
2	2	Why the Truth Might Get You Fired	Consortiumnews.com	Why the Truth Might Get You Fired October 29,	1
3	3	15 Civilians Killed In Single US Airstrike Hav	Jessica Purkiss	Videos 15 Civilians Killed In Single US Airstr	1
4	4	Iranian woman jailed for fictional unpublished	Howard Portnoy	Print \nAn Iranian woman has been sentenced to	1
5	5	Jackie Mason: Hollywood Would Love Trump if He	Daniel Nussbaum	In these trying times, Jackie Mason is the Voi	0
7	7	Benoît Hamon Wins French Socialist Party's Pre	Alissa J. Rubin	PARIS — France chose an idealistic, traditi	0
9	9	A Back-Channel Plan for Ukraine and Russia, Co	Megan Twohey and Scott Shane	A week before Michael T. Flynn resigned as nat	0
10	10	Obama's Organizing for Action Partners with So	Aaron Klein	Organizing for Action, the activist group that	0
11	11	BBC Comedy Sketch "Real Housewives of ISIS" Ca	Chris Tomlinson	The BBC produced spoof on the "Real Housewives	0

In [42]:

In [12]:
df.shape

messages=df.copy()

In [43]:

messages.reset_index(inplace=True)

In [44]:

```
messages.head(10)
```

Out[44]:

	index id		title	author	text	label
0	0	0	House Dem Aide: We Didn't Even See Comey's Let	Darrell Lucus	House Dem Aide: We Didn't Even See Comey's Let	1
1	1	1	FLYNN: Hillary Clinton, Big Woman on Campus	Daniel J. Flynn	Ever get the feeling your life circles the rou	0
2	2	2	Why the Truth Might Get You Fired	Consortiumnews.com	Why the Truth Might Get You Fired October 29,	1
3	3	3	15 Civilians Killed In Single US Airstrike Hav	Jessica Purkiss	Videos 15 Civilians Killed In Single US Airstr	1
4	4	4	Iranian woman jailed for fictional unpublished	Howard Portnoy	Print \nAn Iranian woman has been sentenced to	1
5	5	5	Jackie Mason: Hollywood Would Love Trump if He	Daniel Nussbaum	In these trying times, Jackie Mason is the Voi	0
6	7	7	Benoît Hamon Wins French Socialist Party's Pre	Alissa J. Rubin	PARIS — France chose an idealistic, traditi	0
7	9	9	A Back-Channel Plan for Ukraine and Russia, Co	Megan Twohey and Scott Shane	A week before Michael T. Flynn resigned as nat	0
8	10	10	Obama's Organizing for Action Partners with So	Aaron Klein	Organizing for Action, the activist group that	0
9	11	11	BBC Comedy Sketch "Real Housewives of ISIS" Ca	Chris Tomlinson	The BBC produced spoof on the "Real Housewives	0

In [45]:

```
messages['title'][6]
```

Out[45]:

'Benoît Hamon Wins French Socialist Party's Presidential Nomination - The New York Times'

In [21]:

```
from nltk.corpus import stopwords
from nltk.stem.porter import PorterStemmer
import re
ps = PorterStemmer()
corpus = []
for i in range(0, len(messages)):
    review = re.sub('[^a-zA-Z]', ' ', messages['title'][i])
    review = review.lower()
    review = review.split()

    review = [ps.stem(word) for word in review if not word in stopwords.words('english')]
    review = ' '.join(review)
    corpus.append(review)
```

In [22]:

corpus[3]

Out[22]:

'civilian kill singl us airstrik identifi'

In [46]:

```
## Applying Countvectorizer
# Creating the Bag of Words model
from sklearn.feature_extraction.text import CountVectorizer
cv = CountVectorizer(max_features=5000,ngram_range=(1,3))
X = cv.fit_transform(corpus).toarray()
```

In [47]:

X.shape

Out[47]:

(18285, 5000)

```
In [48]:
y=messages['label']
In [49]:
## Divide the dataset into Train and Test
from sklearn.model_selection import train test split
 X\_train, \ X\_test, \ y\_train, \ y\_test = train\_test\_split(X, \ y, \ test\_size=0.33, \ random\_state=0) 
In [27]:
cv.get feature names()[:20]
Out[27]:
['abandon',
 'abc'
 'abc news',
 'abduct',
 'abe',
 'abedin',
 'abl',
 'abort'
 'abroad'
 'absolut'
 'abstain',
 'absurd',
 'abus',
 'abus new',
 'abus new york',
 'academi',
 'accept',
 'access',
 'access pipelin',
 'access pipelin protest']
In [50]:
cv.get params()
Out[50]:
{'analyzer': 'word',
 'binary': False,
'decode_error': 'strict',
 'dtype': numpy.int64,
 'encoding': 'utf-8',
 'input': 'content',
 'lowercase': True,
 'max_df': 1.0,
 'max features': 5000,
 'min_df': 1,
 'ngram range': (1, 3),
 'preprocessor': None,
 'stop words': None,
 'strip_accents': None,
 'token_pattern': '(?u)\\b\\w\\w+\\b',
 'tokenizer': None,
 'vocabulary': None}
In [51]:
```

count_df = pd.DataFrame(X_train, columns=cv.get_feature_names())

```
In [52]:
count_df.head()
```

Out[52]:

а	bandon	abc	abc news	abduct	abe	abedin	abl	abort	abroad	absolut	 zero	zika	zika viru	zionist	zone	zone new	zone new york	z00	zu	zuck
0	0	0	0	0	0	0	0	0	0	0	 0	0	0	0	0	0	0	0	0	
1	0	0	0	0	0	0	0	0	0	0	 0	0	0	0	0	0	0	0	0	
2	0	0	0	0	0	0	0	0	0	0	 0	0	0	0	0	0	0	0	0	
3	0	0	0	0	0	0	0	0	0	0	 0	0	0	0	0	0	0	0	0	
4	0	0	0	0	0	0	0	0	0	1	 0	0	0	0	0	0	0	0	0	

5 rows × 5000 columns

In [53]:

```
import matplotlib.pyplot as plt
```

In [54]:

```
def plot_confusion_matrix(cm, classes,
                          normalize=False,
                          title='Confusion matrix',
                          cmap=plt.cm.Blues):
   plt.imshow(cm, interpolation='nearest', cmap=cmap)
   plt.title(title)
   plt.colorbar()
   tick_marks = np.arange(len(classes))
   plt.xticks(tick_marks, classes, rotation=45)
   plt.yticks(tick_marks, classes)
   if normalize:
        cm = cm.astype('float') / cm.sum(axis=1)[:, np.newaxis]
        print("Normalized confusion matrix")
        print('Confusion matrix, without normalization')
   thresh = cm.max() / 2.
    for i, j in itertools.product(range(cm.shape[0]), range(cm.shape[1])):
        plt.text(j, i, cm[i, j],
                 horizontalalignment="center",
                 color="white" if cm[i, j] > thresh else "black")
   plt.tight layout()
   plt.ylabel('True label')
   plt.xlabel('Predicted label')
```

MultinomialNB Algorithm

```
In [55]:
```

```
from sklearn.naive_bayes import MultinomialNB
classifier=MultinomialNB()
```

```
In [56]:
```

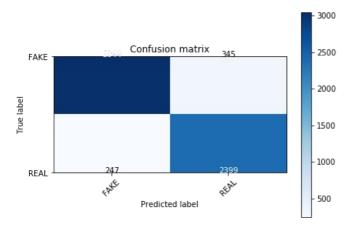
```
from sklearn import metrics
import numpy as np
import itertools
```

In [57]:

```
classifier.fit(X_train, y_train)
pred = classifier.predict(X_test)
score = metrics.accuracy_score(y_test, pred)
print("accuracy: %0.3f" % score)
cm = metrics.confusion_matrix(y_test, pred)
plot_confusion_matrix(cm, classes=['FAKE', 'REAL'])
```

accuracy: 0.902

Confusion matrix, without normalization



classifier.fit(X_train, y_train) pred = classifier.predict(X_test) score = metrics.accuracy_score(y_test, pred) print("accuracy: %0.3f" % score) cm = metrics.confusion_matrix(y_test, pred) plot_confusion_matrix(cm, classes=['FAKE', 'REAL'])

In [43]:

```
classifier.fit(X_train, y_train)
pred = classifier.predict(X_test)
score = metrics.accuracy_score(y_test, pred)
score
```

Out[43]:

0.9019055509527755

In [44]:

```
y_train.shape
```

Out[44]:

(12250,)

Multinomial Classifier with Hyperparameter

In [46]:

```
previous_score=0
for alpha in np.arange(0,1,0.1):
    sub_classifier=MultinomialNB(alpha=alpha)
    sub_classifier.fit(X_train,y_train)
    y_pred=sub_classifier.predict(X_test)
    score = metrics.accuracy_score(y_test, y_pred)
    if score>previous_score:
        classifier=sub_classifier
    print("Alpha: {}, Score : {}".format(alpha,score))
```

C:\Users\sainath\Anaconda3\lib\site-packages\sklearn\naive_bayes.py:485: UserWarning: alpha too smal
l will result in numeric errors, setting alpha = 1.0e-10
 'setting alpha = %.1e' % _ALPHA_MIN)

```
Alpha: 0.0, Score : 0.8903065451532726
Alpha: 0.1, Score : 0.9020712510356255
Alpha: 0.2, Score : 0.9025683512841757
Alpha: 0.30000000000000004, Score : 0.9024026512013256
```

Alpha: 0.4, Score : 0.9017398508699255

Alpha: 0.5, Score: 0.9015741507870754

Alpha: 0.6000000000000001, Score : 0.9022369511184756 Alpha: 0.7000000000000001, Score : 0.9025683512841757

Alpha: 0.8, Score : 0.9015741507870754 Alpha: 0.9, Score : 0.9017398508699255

```
In [47]:
## Get Features names
feature_names = cv.get_feature_names()
In [48]:
classifier.coef [0]
Out[48]:
array([ -9.10038883,
                         -8.62276128,
                                        -9.10038883, ..., -10.79498456,
         -8.91467169,
                        -9.32864749])
In [49]:
### Most real
sorted(zip(classifier.coef [0], feature names), reverse=True)[:20]
[(-4.000149156604985, 'trump'),
 (-4.287872694443541, 'hillari'),
 (-4.396389621061519, 'clinton'),
(-4.899969726208735, 'elect'),
 (-5.176598600897756, 'new')
 (-5.234730366348767, 'comment'),
 (-5.273968180973631, 'video'),
 (-5.3868167681180115, 'war'), (-5.396821854078974, 'us'),
 (-5.412019714988405, 'hillari clinton'),
 (-5.417137433425386, 'fbi'),
(-5.48068448454208, 'vote'),
 (-5.566255475855405, 'email'),
 (-5.578238842742501, 'world'),
 (-5.634015380199913, 'obama'),
(-5.734501455772904, 'donald')
 (-5.763095255139644, 'donald trump'),
 (-5.785090276725191, 'russia'),
 (-5.846224665218559, 'day'),
(-5.862110622807369, 'america')]
In [53]:
### Most fake
sorted(zip(classifier.coef [0], feature names))[:2000]
Out[53]:
[(-10.794984555596727, 'abe'),
 (-10.794984555596727, 'abroad')
 (-10.794984555596727, 'abus new'),
 (-10.794984555596727, 'abus new york'),
(-10.794984555596727, 'act new'),
 (-10.794984555596727, 'act new york'),
 (-10.794984555596727, 'advic'),
 (-10.794984555596727, 'advis new'),
 (-10.794984555596727,
                          'advis new york'),
 (-10.794984555596727, 'age new')
 (-10.794984555596727, 'age new york'),
 (-10.794984555596727,
                          'agenda breitbart'),
 (-10.794984555596727,
                          'ail'),
 (-10.794984555596727,
                          'aleppo new'),
                          'aleppo new york'),
 (-10.794984555596727,
 (-10.794984555596727,
                          'ali'),
 (-10.794984555596727,
                          'america breitbart'),
 (-10.794984555596727, 'america new york'),
                         'american breitbart'),
 (-10.794984555596727,
 (-10.794984555596727,
                          'american new'),
 (-10.794984555596727,
                          'american new york'),
 (-10.794984555596727, 'ami'),
 (-10.794984555596727, 'ami schumer'),
 (-10.794984555596727,
                          'amp'),
 (-10.794984555596727,
                          'ann'),
 (-10.794984555596727, 'ann coulter'),
 (-10.794984555596727, 'applaud'),
 (-10.794984555596727,
                          'arson'),
                          'asian')
 (-10.794984555596727,
 (-10.794984555596727, 'assail'),
 (-10.794984555596727, 'athlet'),
 (-10.794984555596727, 'attack breitbart'), (-10.794984555596727, 'attack new'),
 (-10.794984555596727, 'attack new york'),
 (-10.794984555596727, 'attack syria'),
```

```
(-10.794984555596727, 'avert'),
(-10.794984555596727, 'away new'),
(-10.794984555596727, 'away new york'),
(-10.794984555596727, 'back new'),
(-10.794984555596727, 'back new york'),
(-10.794984555596727, 'baltimor'),
(-10.794984555596727, 'ban breitbart'),
(-10.794984555596727, 'ban new'),
(-10.794984555596727, 'ban new york'),
(-10.794984555596727, 'bangladesh'),
(-10.794984555596727, 'barron trump'),
(-10.794984555596727, 'basic'),
(-10.794984555596727, 'basketbal'),
(-10.794984555596727, 'basketbal player'),
(-10.794984555596727, 'baton'),
(-10.794984555596727, 'baton roug'),
(-10.794984555596727, 'battl new'),
(-10.794984555596727,
                               'battl new york'),
(-10.794984555596727, 'bay'),
(-10.794984555596727, 'beach new'),
(-10.794984555596727, 'beach new york'),
(-10.794984555596727, 'begin new'),
(-10.794984555596727, 'behead photo'),
(-10.794984555596727, 'behind trump'),
(-10.794984555596727, 'berkeley breitbart'),
(-10.794984555596727, 'betsi'),
(-10.794984555596727, 'betsi devo'),
(-10.794984555596727, 'bill breitbart'),
(-10.794984555596727, 'bill new'),
(-10.794984555596727, 'bill new york'),
(-10.794984555596727, 'bill reilli'),
(-10.794984555596727, 'billi'),
(-10.794984555596727, 'blue state'),
(-10.794984555596727, 'blue state blue'),
(-10.794984555596727, 'bolster'),
(-10.794984555596727, 'border patrol'),
(-10.794984555596727, 'border patrol agent'),
(-10.794984555596727, 'border state'),
(-10.794984555596727, 'border wall'),
(-10.794984555596727, 'border wall breitbart'),
(-10.794984555596727, 'bowl')
(-10.794984555596727, 'box offic'),
(-10.794984555596727, 'bradi'),
(-10.794984555596727, 'breath'),
(-10.794984555596727, 'breitbart news daili'),
(-10.794984555596727, 'brief new'),
(-10.794984555596727, 'brief new york'),
(-10.794984555596727, 'broadway'),
(-10.794984555596727, 'bronx'),
(-10.794984555596727, 'brooklyn'),
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(-10.794984555596727, 'brooklyn new york'),
(-10.794984555596727, 'bureaucrat'),
(-10.794984555596727, 'caitlyn'),
(-10.794984555596727, 'caitlyn jenner'),
(-10.794984555596727, 'cal'),
(-10.794984555596727, 'california today'),
(-10.794984555596727, 'calm'),
(-10.794984555596727, 'campaign breitbart'),
(-10.794984555596727, 'campaign new'),
(-10.794984555596727, 'campaign new york'),
(-10.794984555596727, 'campu breitbart'), (-10.794984555596727, 'cann'),
(-10.794984555596727, 'car new'),
(-10.794984555596727, 'car new york'),
(-10.794984555596727, 'care act'),
(-10.794984555596727, 'care act new'),
(-10.794984555596727, 'care bill'),
(-10.794984555596727, 'care breitbart'),
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(-10.794984555596727, 'caucu'),
(-10.794984555596727, 'ceas'),
(-10.794984555596727, 'ceas fire'),
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(-10.794984555596727, 'championship new'),
(-10.794984555596727, 'championship new york'),
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(-10.794984555596727, 'chang new york'),
```

```
(-10.794984555596727, 'charg new york'),
(-10.794984555596727, 'charleston'),
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                       'charlott'),
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                       'citizenship'),
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                       'colleg new'),
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                       'collid'),
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                       'collin'),
                       'comedi'),
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                       'common core')
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                       'common ground'),
                       'compet'),
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(-10.794984555596727,
                       'complex'),
                       'conceal'),
(-10.794984555596727,
(-10.794984555596727,
                       'confirm hear'),
                       'congress breitbart'),
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(-10.794984555596727,
                       'congress new york'),
(-10.794984555596727, 'control new'),
(-10.794984555596727,
                       'control new york'),
                       'convent new'),
(-10.794984555596727,
(-10.794984555596727,
                       'convent new york'),
(-10.794984555596727, 'corner'),
(-10.794984555596727, 'coulter'),
(-10.794984555596727,
                       'counsel'),
(-10.794984555596727, 'countri breitbart'),
(-10.794984555596727, 'cours'),
(-10.794984555596727, 'court block'),
                       'court new'),
(-10.794984555596727,
(-10.794984555596727,
                       'court new york'),
(-10.794984555596727, 'court rule new'),
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(-10.794984555596727, 'crown'),
                       'cunningham'),
(-10.794984555596727,
(-10.794984555596727,
                       'curb'),
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                       'davo'),
(-10.794984555596727, 'day breitbart'),
(-10.794984555596727,
                       'day new york'),
(-10.794984555596727,
                       'day parad'),
(-10.794984555596727,
                       'dead new'),
(-10.794984555596727,
                       'dead new york'),
                       'deal breitbart'),
(-10.794984555596727,
(-10.794984555596727,
                       'deal new'),
(-10.794984555596727,
                       'deal new york'),
(-10.794984555596727,
                       'death new'),
                       'death new york'),
(-10.794984555596727,
(-10.794984555596727,
                       'debat new'),
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