Installing libraries

In [1]:
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sn
import nltk
import re

from nltk.corpus import stopwords
from nltk.stem.porter import PorterStemmer
from sklearn.feature_extraction.text import CountVectorizer

from sklearn.preprocessing import LabelEncoder
from sklearn.metrics import confusion_matrix
from sklearn.model_selection import train_test_split

from sklearn.tree import DecisionTreeClassifier
from sklearn.ensemble import RandomForestClassifier
```

Importing Dataset

In [2]:
```
data=pd.read_csv("C:\\Users\\HP\\datasets\\spam.csv",encoding='latin-1')
data
```

Out[2]:

	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
...	...	...	...	...	...
5567	spam	This is the 2nd time we have tried 2 contact u...	NaN	NaN	NaN
5568	ham	Will Ì_ b going to esplanade fr home?	NaN	NaN	NaN
5569	ham	Pity, * was in mood for that. So...any other s...	NaN	NaN	NaN
5570	ham	The guy did some bitching but I acted like i'd...	NaN	NaN	NaN
5571	ham	Rofl. Its true to its name	NaN	NaN	NaN

5572 rows × 5 columns

In [3]:
```
#DROPPING UNUSEFUL COLUMNS
data=data.drop(['Unnamed: 2','Unnamed: 3','Unnamed: 4'],axis=1)
data
```

Out[3]:

	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...
...	...	...
5567	spam	This is the 2nd time we have tried 2 contact u...
5568	ham	Will Ì_ b going to esplanade fr home?
5569	ham	Pity, * was in mood for that. So...any other s...
5570	ham	The guy did some bitching but I acted like i'd...
5571	ham	Rofl. Its true to its name

5572 rows × 2 columns

In [4]:
```
#RENAMING THE COLUMN NAMES WITH SOME RELEVANT NAMES
data.rename(columns={"v1":"result","v2":"messege"},inplace=True)
data
```

Out[4]:

	result	messege
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...
...	...	...
5567	spam	This is the 2nd time we have tried 2 contact u...
5568	ham	Will Ì_ b going to esplanade fr home?
5569	ham	Pity, * was in mood for that. So...any other s...
5570	ham	The guy did some bitching but I acted like i'd...
5571	ham	Rofl. Its true to its name

5572 rows × 2 columns

In [5]:
```
#LABELLING THE CONTENTS OF THE 'RESULT' COLUMN INTO NUMERIC VALUE
le_result=LabelEncoder()
data['result']=le_result.fit_transform(data['result'])
data
```

Out[5]:

	result	messege
0	0	Go until jurong point, crazy.. Available only ...
1	0	Ok lar... Joking wif u oni...
2	1	Free entry in 2 a wkly comp to win FA Cup fina...
3	0	U dun say so early hor... U c already then say...
4	0	Nah I don't think he goes to usf, he lives aro...
...	...	...
5567	1	This is the 2nd time we have tried 2 contact u...
5568	0	Will Ì_ b going to esplanade fr home?
5569	0	Pity, * was in mood for that. So...any other s...
5570	0	The guy did some bitching but I acted like i'd...
5571	0	Rofl. Its true to its name

5572 rows × 2 columns

Preprocessing Messege

In [6]:
```
data['messege'][0]
```

Out[6]:
```
'Go until jurong point, crazy.. Available only in bugis n great world la e buffet... Cine there got amore wat...'
```

In [7]:
```
#PREPARING WORD VECTOR CORPUS
corpus=[]
```

In [8]:
```
#USING PORTER STEMMER
ps=PorterStemmer()
```

In [9]:
```
#APPLYING REGULAR EXPRESSION
for i in range(0, 5572):

    msg = data['messege'][i]
    #REPLACE EMAIL ADDRESSES WITH 'emailaddr'
    msg = re.sub('\b[\w\-.]+?@\w+?\.\w{2,4}\b', 'emailaddr', data['messege'][i])
    #REPLACE URLs WITH 'httpaddr'
    msg = re.sub('(http[s]?\S+)|(\w+\.[A-Za-z]{2,4}\S*)', 'httpaddr', data['messege'][i])
    #REPLACE MONEY SYMBOLS WITH 'moneysymb'
    msg = re.sub('([A-Z]{3}|[A-Z]?[\$€¥])?\s?(\d{1,3}((,\d{1,3})+)?(.\d{1,3})?(.\d{1,3})?(,\d{1,3})?)', 'moneysymb', data['messege'][i])
    #REPLACE PHONE NUMBERS WITH 'phonenumbr'
    msg = re.sub('\b(\+\d{1,2}\s)?\d?[\-(.]?\d{3}\)?[\s.-]?\d{3}[\s.-]?\d{4}\b', 'phonenumbr', data['messege'][i])
    #REPLACE NUMBERS WITH 'numbr'
    msg = re.sub('\d+(\.\d+)?', 'numbr', data['messege'][i])

    #REMOVE ALL PUNCTUATIONS
    msg = re.sub('[^\w\d\s]', ' ', data['messege'][i])

    if i<1:
        print("\t\t\t\t MESSAGE ", i)

    if i<1:
        print("\n After Regular Expression - Message ", i, " : ", msg)

    # EACH WORD TO LOWER CASE
    msg = msg.lower()
    if i<1:
        print("\n Lower case Message ", i, " : ", msg)

    # SPLITTING WORDS INTO TOKENS
    msg = msg.split()
    if i<1:
        print("\n After Splitting - Message ", i, " : ", msg)

    # STEMMING WITH PorterStemmer HANDLING Stop Words
    msg = [ps.stem(word) for word in msg if not word in set(stopwords.words('english'))]
    if i<1:
        print("\n After Stemming - Message ", i, " : ", msg)

    # PREPARING MESSAGES WITH REMAINING TOKENS
    msg = ' '.join(msg)
    if i<1:
        print("\n Final Prepared - Message ", i, " : ", msg, "\n\n")

    # PREPARING WordVector Corpus
    corpus.append(msg)
```

```
                                 MESSAGE  0

 After Regular Expression - Message  0  :  Go until jurong point  crazy   Available only in bugis n great world la e buffet    Cine there got amore wat

 Lower case Message  0  :  go until jurong point  crazy   available only in bugis n great world la e buffet    cine there got amore wat

 After Splitting - Message  0  :  ['go', 'until', 'jurong', 'point', 'crazy', 'available', 'only', 'in', 'bugis', 'n', 'great', 'world', 'la', 'e', 'buffet', 'cine', 'there', 'got', 'amore', 'wat']

 After Stemming - Message  0  :  ['go', 'jurong', 'point', 'crazi', 'avail', 'bugi', 'n', 'great', 'world', 'la', 'e', 'buffet', 'cine', 'got', 'amor', 'wat']

 Final Prepared - Message  0  :  go jurong point crazi avail bugi n great world la e buffet cine got amor wat
```

Preparing vectors for each messege

In [10]:
```
cv=CountVectorizer()
cv
```

Out[10]:
```
CountVectorizer()
```

In [11]:
```
data_input=cv.fit_transform(corpus).toarray()
```

In [12]:
```
data_input[0]
```

Out[12]:
```
array([0, 0, 0, ..., 0, 0, 0], dtype=int64)
```

Applying classifier

In [13]:
```
data_output=data['result']
data_output
```

Out[13]:
```
0       0
1       0
2       1
3       0
4       0
       ..
5567    1
5568    0
5569    0
5570    0
5571    0
Name: result, Length: 5572, dtype: int32
```

Splitting the data into train and test data

In [34]:
```
xtrain,xtest,ytrain,ytest=train_test_split(data_input,data_output,test_size=0.2)
```

In [35]:
```
len(xtrain)
```

Out[35]:
```
4457
```

In [36]:
```
len(xtest)
```

Out[36]:
```
1115
```

Modelling

Applying Decision Tree

In [37]:
```
decisiontree_classifier=DecisionTreeClassifier()
decisiontree_classifier.fit(xtrain,ytrain)
```

Out[37]:
```
DecisionTreeClassifier()
```

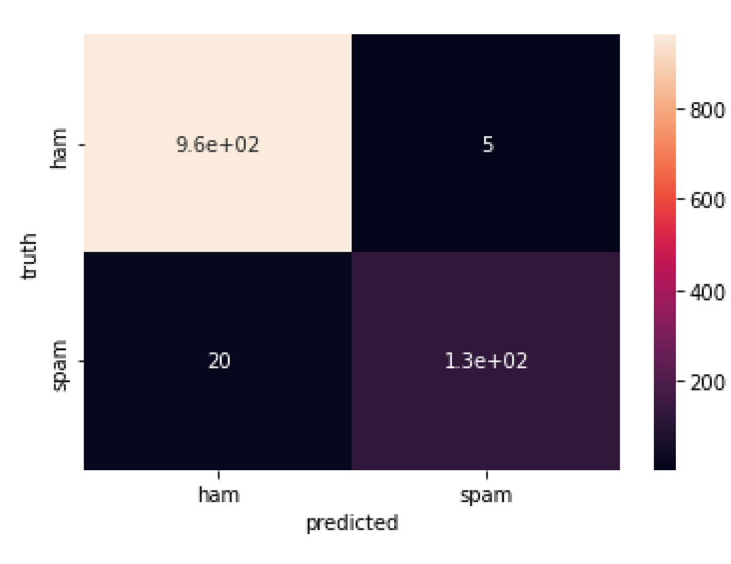
In [38]:
```
ypred=decisiontree_classifier.predict(xtest)
```

In [39]:
```
#Evaluating
cm = confusion_matrix(ytest, ypred)
print(cm)
```

```
[[960   5]
 [ 20 130]]
```

In [40]:
```
sn.heatmap(cm,annot=True,xticklabels=['ham','spam'],yticklabels=['ham','spam'])
plt.xlabel('predicted')
plt.ylabel('truth')
```

Out[40]:
```
Text(33.0, 0.5, 'truth')
```



In [41]:
```
decisiontree_classifier.score(xtest,ytest)
```

Out[41]:
```
0.9775784753363229
```

Applying Random Forest

In [42]:
```
randomforest_classifier=RandomForestClassifier()
randomforest_classifier.fit(xtrain,ytrain)
```

Out[42]:
```
RandomForestClassifier()
```

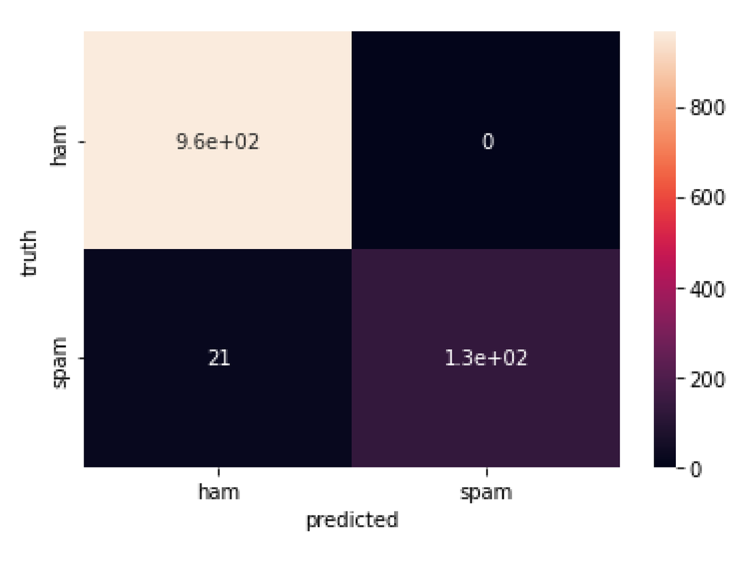
In [43]:
```
ypred=randomforest_classifier.predict(xtest)
```

In [44]:
```
#Evaluating
cm = confusion_matrix(ytest, ypred)
print(cm)
```

```
[[965   0]
 [ 21 129]]
```

In [45]:
```
sn.heatmap(cm,annot=True,xticklabels=['ham','spam'],yticklabels=['ham','spam'])
plt.xlabel('predicted')
plt.ylabel('truth')
```

Out[45]:
```
Text(33.0, 0.5, 'truth')
```



In [46]:
```
randomforest_classifier.score(xtest,ytest)
```

Out[46]:
```
0.9811659192825112
```

Final Accuracy

```
Decision Tree : 97.75%
Random Forest : 98.11%
```