Email Spam Detection with Machine Learning

****importing libraries

In [243]:
```
import numpy as np
import pandas as pd
import seaborn as sn
import matplotlib.pyplot as plt
```

****loading datset

In [244]:
```
df=pd.read_csv('E:\spam.csv',encoding='latin1')
df
```

Out[244]:

	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 [249]:
```
df.head()
```

Out[249]:

	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 [245]:
```
df.tail()
```

Out[245]:

	v1	v2	Unnamed: 2	Unnamed: 3	Unnamed: 4
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

In [250]:
```
df.describe()
```

Out[250]:

	v1	v2	Unnamed: 2	Unnamed: 3	Unnamed: 4
count	5572	5572	50	12	6
unique	2	5169	43	10	5
top	ham	Sorry, I'll call later	bt not his girlfrnd... G o o d n i g h t . . .@"	MK17 92H. 450Ppw 16"	GNT:-)"
freq	4825	30	3	2	2

In [248]:
```
df.describe
```

Out[248]:
```
<bound method NDFrame.describe of          v1
v2 Unnamed: 2  \
0      ham  Go until jurong point, crazy.. Available only ...        NaN
1      ham                      Ok lar... Joking wif u oni...        NaN
2     spam  Free entry in 2 a wkly comp to win FA Cup fina...        NaN
3      ham  U dun say so early hor... U c already then say...        NaN
4      ham  Nah I don't think he goes to usf, he lives aro...        NaN
...    ...                                                ...        ...
5567  spam  This is the 2nd time we have tried 2 contact u...        NaN
5568   ham              Will Ì_ b going to esplanade fr home?        NaN
5569   ham  Pity, * was in mood for that. So...any other s...        NaN
5570   ham  The guy did some bitching but I acted like i'd...        NaN
5571   ham                         Rofl. Its true to its name        NaN

     Unnamed: 3 Unnamed: 4
0           NaN        NaN
1           NaN        NaN
2           NaN        NaN
3           NaN        NaN
4           NaN        NaN
...         ...        ...
5567        NaN        NaN
5568        NaN        NaN
5569        NaN        NaN
5570        NaN        NaN
5571        NaN        NaN

[5572 rows x 5 columns]>
```

In [251]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 5572 entries, 0 to 5571
Data columns (total 5 columns):
 #   Column      Non-Null Count  Dtype 
---  ------      --------------  ----- 
 0   v1          5572 non-null   object
 1   v2          5572 non-null   object
 2   Unnamed: 2  50 non-null     object
 3   Unnamed: 3  12 non-null     object
 4   Unnamed: 4  6 non-null      object
dtypes: object(5)
memory usage: 217.8+ KB
```

In [252]:
```
df.columns
```

Out[252]:
```
Index(['v1', 'v2', 'Unnamed: 2', 'Unnamed: 3', 'Unnamed: 4'], dtype='object')
```

In [253]:
```
df.isnull().sum()
```

Out[253]:
```
v1               0
v2               0
Unnamed: 2    5522
Unnamed: 3    5560
Unnamed: 4    5566
dtype: int64
```

In [254]:
```
df['v1'].unique()
```

Out[254]:
```
array(['ham', 'spam'], dtype=object)
```

In [255]:
```
df['v2'].unique()
```

Out[255]:
```
array(['Go until jurong point, crazy.. Available only in bugis n great world la e buffe
t... Cine there got amore wat...',
       'Ok lar... Joking wif u oni...',
       "Free entry in 2 a wkly comp to win FA Cup final tkts 21st May 2005. Text FA to 8
7121 to receive entry question(std txt rate)T&C's apply 08452810075over18's",
       ..., 'Pity, * was in mood for that. So...any other suggestions?',
       "The guy did some bitching but I acted like i'd be interested in buying something
else next week and he gave it to us for free",
       'Rofl. Its true to its name'], dtype=object)
```

In [256]:
```
df['Unnamed: 2'].nunique()
```

Out[256]:
```
43
```

In [257]:
```
df['Unnamed: 3'].nunique()
```

Out[257]:
```
10
```

In [258]:
```
df['Unnamed: 4'].nunique()
```

Out[258]:
```
5
```

In [259]:
```
df.dropna()
```

Out[259]:

	v1	v2	Unnamed: 2	Unnamed: 3	Unnamed: 4
281	ham	\Wen u miss someone	the person is definitely special for u..... B...	why to miss them	just Keep-in-touch\" gdeve.."
1038	ham	Edison has rightly said, \A fool can ask more ...	GN	GE	GNT:-)"
2255	ham	I just lov this line: \Hurt me with the truth	I don't mind	i wil tolerat.bcs ur my someone..... But	Never comfort me with a lie\" gud ni8 and swe...
3525	ham	\HEY BABE! FAR 2 SPUN-OUT 2 SPK AT DA MO... DE...	HAD A COOL NYTHO	TX 4 FONIN HON	CALL 2MWEN IM BK FRMCLOUD 9! J X\""
4668	ham	When I was born, GOD said, \Oh No! Another IDI...	GOD said	\"OH No! COMPETITION\". Who knew	one day these two will become FREINDS FOREVER!"
5048	ham	Edison has rightly said, \A fool can ask more ...	GN	GE	GNT:-)"

In [260]:
```
df.dropna().nunique()
```

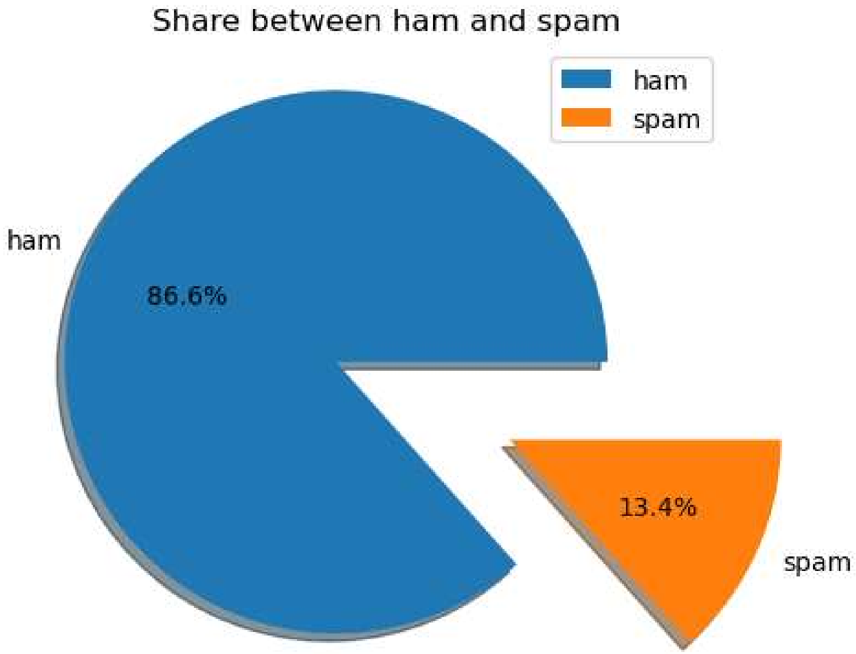
Out[260]:
```
v1            1
v2            5
Unnamed: 2    5
Unnamed: 3    5
Unnamed: 4    5
dtype: int64
```

In [261]:

```
k=df.groupby('v1')
c1=k['v2'].count()
exp1=[0.2,0.5]
plt.pie(c1,labels=df['v1'].unique(),autopct='%1.1f%%',shadow=True,explode=exp1)
plt.title('Share between ham and spam')
plt.legend()
```

Out[261]:

```
<matplotlib.legend.Legend at 0x2a4f26983a0>
```



```
****since we can observe that minority of messages are spam.
>since majority of data in unnamed 2,3,4 are Nan values
we are going to drop /delete them.
```

In [262]:

```
df.drop('Unnamed: 2',axis=1,inplace=True)
del df['Unnamed: 3']
del df['Unnamed: 4']
print(df.head())
```

```
     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...
```

```
****importing sklearn
```

In [263]:

```
from sklearn.model_selection import train_test_split
from sklearn.feature_extraction.text import CountVectorizer
from sklearn import svm
```

In [264]:

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

Out[264]:

```
v1    0
v2    0
dtype: int64
```

```
****no Null values
```

In [265]:

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 5572 entries, 0 to 5571
Data columns (total 2 columns):
 #   Column  Non-Null Count  Dtype 
---  ------  --------------  ----- 
 0   v1      5572 non-null   object
 1   v2      5572 non-null   object
dtypes: object(2)
memory usage: 87.2+ KB
```

```
****removing duplicate values
```

In [266]:

```
df=df.drop_duplicates()
```

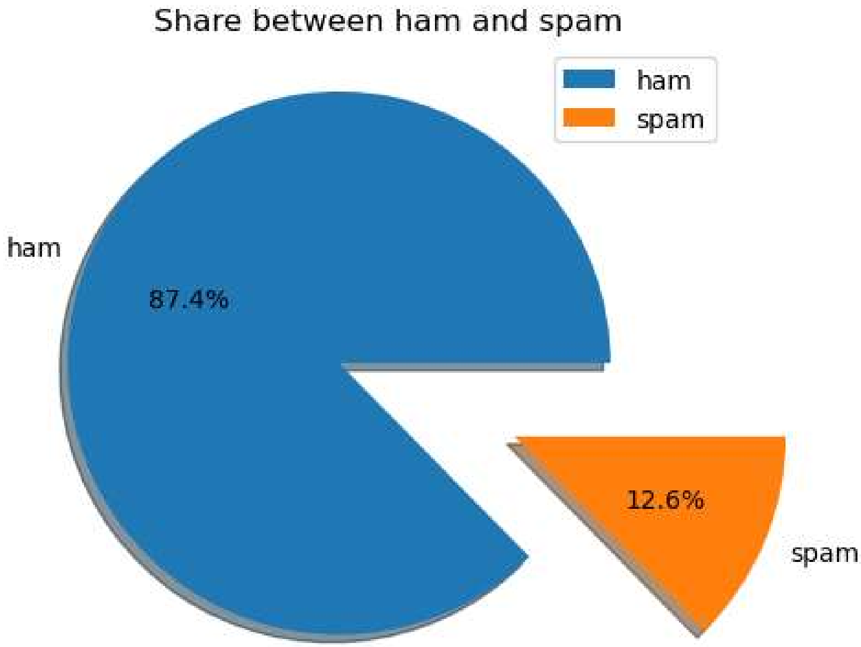
In [236]:

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 5169 entries, 0 to 5571
Data columns (total 2 columns):
 #   Column  Non-Null Count  Dtype 
---  ------  --------------  ----- 
 0   v1      5169 non-null   object
 1   v2      5169 non-null   object
dtypes: object(2)
memory usage: 121.1+ KB
```

In [237]:
```
k1=df.groupby('v1')
k2=k1['v2'].count()
exp1=[0.2,0.5]
plt.pie(k2,labels=df['v1'].unique(),autopct='%1.1f%%',shadow=True,explode=exp1)
plt.title('Share between ham and spam')
plt.legend()
```

Out[237]:
```
<matplotlib.legend.Legend at 0x2a4f2699c60>
```



```
****we can observe that after removing duplicates
>change in the ratio's of spam and ham
```

In [238]:
```
x1=df['v2']
y1=df['v1']
```

```
****here x1 is the input data
here y1 is the target data
```

In [274]:
```
print(x1_train)
```

```
2710    Hope you enjoyed your new content. text stop t...
3464    Haha figures, well I found the piece and prisc...
2051    Hey darlin.. i can pick u up at college if u t...
5567    This is the 2nd time we have tried 2 contact u...
1967    Even i cant close my eyes you are in me our va...
                               ...
5045    Desires- u going to doctor 4 liver. And get a ...
5014    I think the other two still need to get cash b...
4760    It's Ì© only $140 ard...Ìä rest all ard $180 a...
3600                              Jay told me already, will do
4131    Hi baby ive just got back from work and i was ...
Name: v2, Length: 3876, dtype: object
```

In [275]:
```
print(x1_test)
```

```
368                               Wat uniform? In where get?
2048                               So dont use hook up any how
571                     Do you know where my lab goggles went
1570    No:-)i got rumour that you going to buy apartm...
1186     Goodmorning, Today i am late for  &lt;#&gt; min.
                              ...
5078    Mark works tomorrow. He gets out at 5. His wor...
1714                                 Yeah I don't see why not
496     Nope... Think i will go for it on monday... So...
4860                                   Nokia phone is lovly..
4226                           Buy one egg for me da..please:)
Name: v2, Length: 1293, dtype: object
```

In [276]:
```
print(y1_train)
```

```
2710    spam
3464     ham
2051     ham
5567    spam
1967     ham
        ...
5045     ham
5014     ham
4760     ham
3600     ham
4131     ham
Name: v1, Length: 3876, dtype: object
```

In [277]:
```
print(y1_test)
```

```
368     ham
2048    ham
571     ham
1570    ham
1186    ham
       ...
5078    ham
1714    ham
496     ham
4860    ham
4226    ham
Name: v1, Length: 1293, dtype: object
```

****Machine Learning Model

In [267]:
```
x1_train,x1_test,y1_train,y1_test=train_test_split(x1,y1,test_size=0.25)
```

In [268]:
```
cv = CountVectorizer()
features = cv.fit_transform(x1_train)
```

***SVM -Support Vector Machine Algorithm
>a linear model for classification and regression

```
>the algorithm creates a line, or a hyperplane, which separates the data into classes
```

In [269]:

```
model = svm.SVC()
model.fit(features,y1_train)
```

Out[269]:

```
▾ SVC

SVC()
```

In [271]:

```
features_test = cv.transform(x1_test)
print(" Accuracy of the model is",(model.score(features_test,y1_test))*100)
```

```
 Accuracy of the model is 97.52513534416086
```

```
****we have successfully created the machine learning model  with Accuracy of morethan
97%
```

*hence the task is completed.