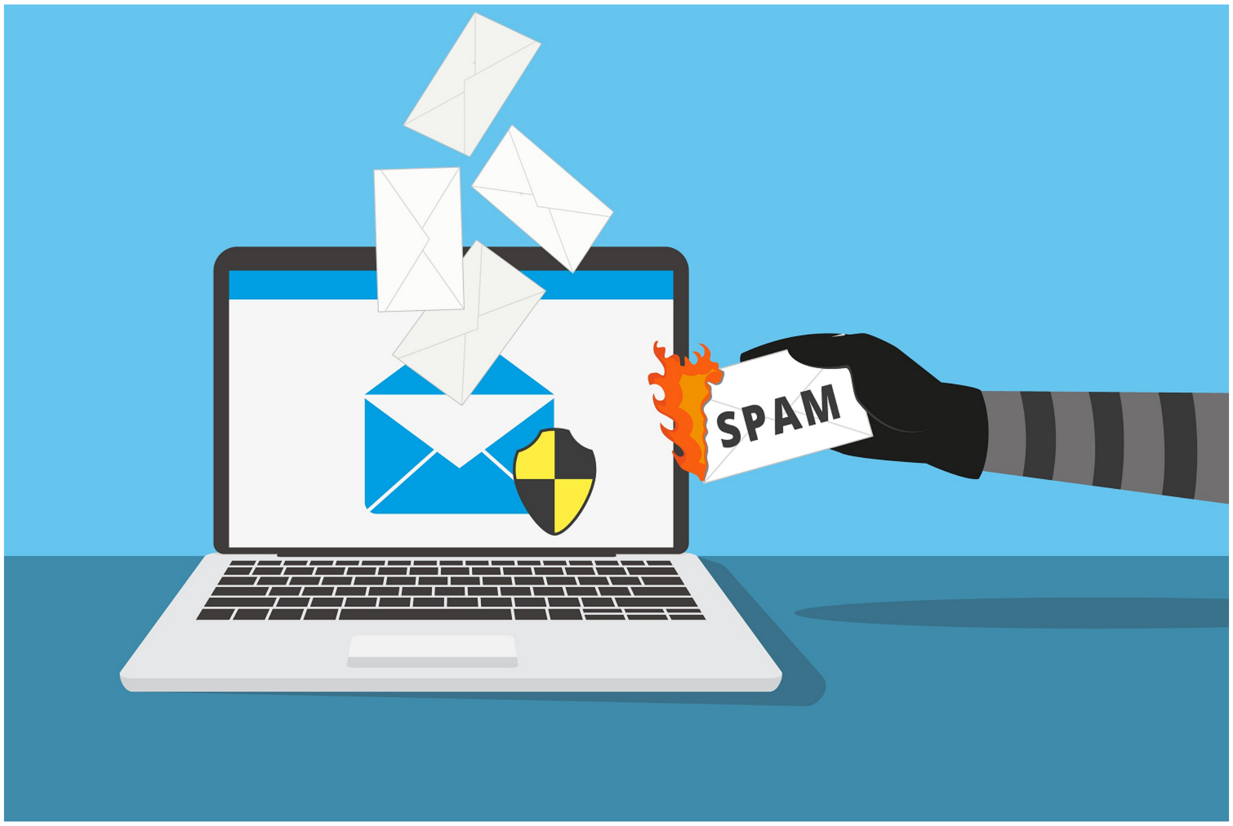
Naive Bayes Tutorial Part 2: Explore Spam Email Dataset



In [1]:
```python
import pandas as pd
```

In [2]:
```python
df = pd.read_csv("D:/Data_Science/My Github/Machine-Learning-with-Python/14. naiv
df.head()
```

Out[2]:

	Category	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 [3]:
```
df.groupby('Category').describe()
```
Out[3]:

	Message			
	count	unique	top	freq
Category				
ham	4825	4516	Sorry, I'll call later	30
spam	747	641	Please call our customer service representativ...	4

In [4]:
```
#Convert Category into numbers spam=1  ham=0
df['spam']=df['Category'].apply(lambda x: 1 if x=='spam' else 0)
df.head()
```
Out[4]:

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

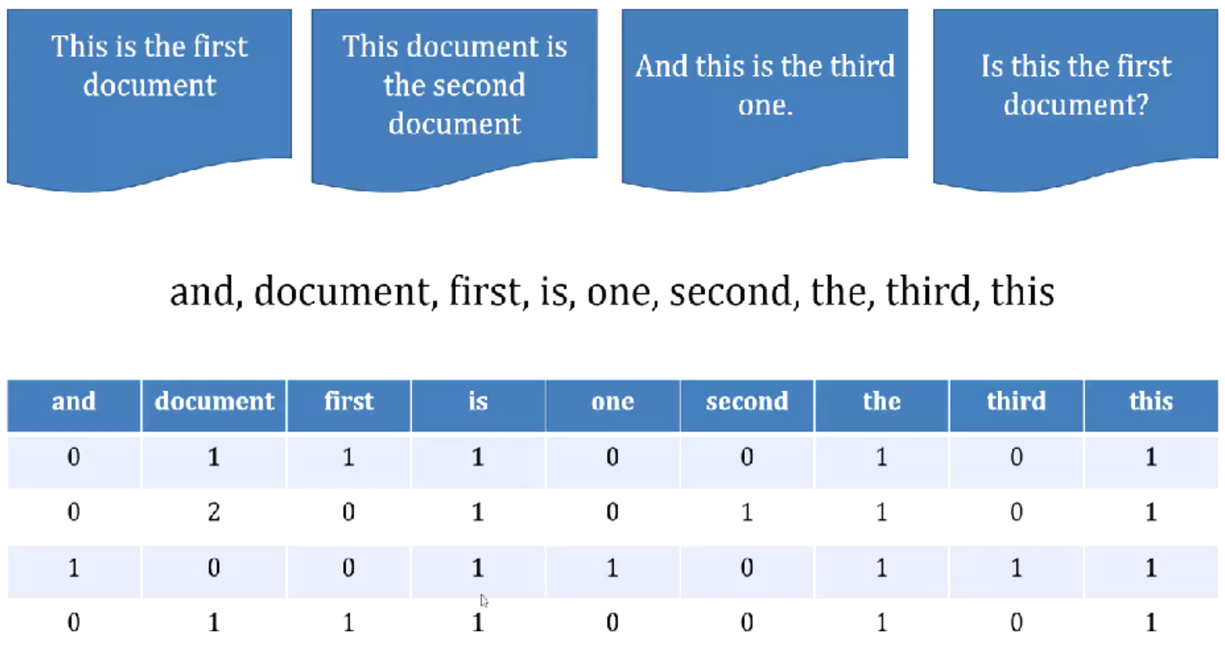
train test split

In [5]:
```
from sklearn.model_selection import train_test_split
X_train, X_test, y_train, y_test = train_test_split(df.Message,df.spam,test_size
```

But Message column is still text and must convert it into numbers.**Solution: CountVectorizing Technique**

CountVectorizing Technique

Assume you have 4 documents with all these text. One of the ways to convert this into matrix or vector is you found that the unique words in each of these documents(**i.e. and, document, first, is, one, second, the, third, this**). Now you can treat these 9 words as feature and you can build a matrix. Look at the first column: the occurance of "and" in first document is 0, and so on.


This is the first document

This document is the second document

And this is the third one.

Is this the first document?

and, document, first, is, one, second, the, third, this

and	document	first	is	one	second	the	third	this
0	1	1	1	0	0	1	0	1
0	2	0	1	0	1	1	0	1
1	0	0	1	1	0	1	1	1
0	1	1	1	0	0	1	0	1

In [6]:
```
from sklearn.feature_extraction.text import CountVectorizer
v = CountVectorizer()
X_train_count = v.fit_transform(X_train.values)
X_train_count.toarray()[:2]
```

Out[6]:
```
array([[0, 0, 0, ..., 0, 0, 0],
       [0, 0, 0, ..., 0, 0, 0]], dtype=int64)
```

There are 3 types of Naive Bayes model under the scikit-learn library:

1. Bernoulli: The binomial model is useful if your **feature** vectors are binary (**i.e. zeros and ones**).
2. Multinomial: It is used for **discrete data**(e.g. movie ratings rangong 1 and 5 as each rating will have certain **frequency** to represent). In text learning we have the **count** of each word to predict the class or label.
3. Gaussian: It is used in classification and it assumes that features follow a **normal distribution**.

In [7]:
```
from sklearn.naive_bayes import MultinomialNB
model = MultinomialNB()
model.fit(X_train_count,y_train)
```

Out[7]:
```
MultinomialNB()
```

In [8]:
```
emails = [
    'Hey mohan, can we get together to watch footbal game tomorrow?',
    'Upto 20% discount on parking, exclusive offer just for you. Dont miss this r
]
emails_count = v.transform(emails)
model.predict(emails_count)
```

Out[8]:
```
array([0, 1], dtype=int64)
```

It predicts the second email as '1' which is spam.

In [9]:
```
# measure the accuracy
X_test_count = v.transform(X_test)
model.score(X_test_count, y_test)
```

Out[9]:
```
0.9849246231155779
```

Problem: Whenever I want to use the model.fit I should use v.transform my data. (**Solution: Sklearn pipeline**)

Sklearn Pipeline

In [10]:
```
from sklearn.pipeline import Pipeline
clf = Pipeline([
    ('vectorizer', CountVectorizer()),
    ('nb', MultinomialNB())
])
```

Here I created a pipeline in 2 steps:

1. Convert my text into vector by using CountVectorizer
2. Apply the MultinomialNB

In [11]:
```
# This time there is no need for transform data
clf.fit(X_train, y_train)
```

Out[11]:
```
Pipeline(steps=[('vectorizer', CountVectorizer()), ('nb', MultinomialNB())])
```

In [12]:
```
clf.score(X_test,y_test)
```

Out[12]:
```
0.9849246231155779
```

In [13]:
```
clf.predict(emails)
```

Out[13]:
```
array([0, 1], dtype=int64)
```

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2021-10-14	Ehsan Zia