SMS and Email Spam Classifier

About dataset

The SMS Spam Collection is a set of SMS tagged messages that have been collected for SMS Spam research. It contains one set of SMS messages in English of 5,574 messages, tagged acording being ham (legitimate) or spam.

In [ ]:
```
# Import needed libraries
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.linear_model import LogisticRegression
from sklearn.preprocessing import LabelEncoder
from sklearn.feature_extraction.text import TfidfVectorizer
from sklearn.model_selection import train_test_split
from sklearn.naive_bayes import MultinomialNB
from sklearn.svm import SVC
from sklearn.metrics import classification_report
from sklearn.metrics import confusion_matrix
import warnings
warnings.filterwarnings('ignore')
```

In [2]:
```
# Data reading with read_csv function
data = pd.read_csv('/content/drive/MyDrive/Docs for collab/Spam /spam.csv',
encoding="ISO-8859-1")
data.head()
```

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

In [3]:
```
data.rename(columns={'v1':'Type','v2':'Content'},inplace=True)
```

In [4]:
```
# Getting quick info
df = data[['Type','Content']]
df.info()
```

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

In [5]:
```
# viewing first 5 data points
df.head()
```

Out[5]:

	Type	Content
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 [6]:
```
# Checking null values
df.isnull().sum()
```

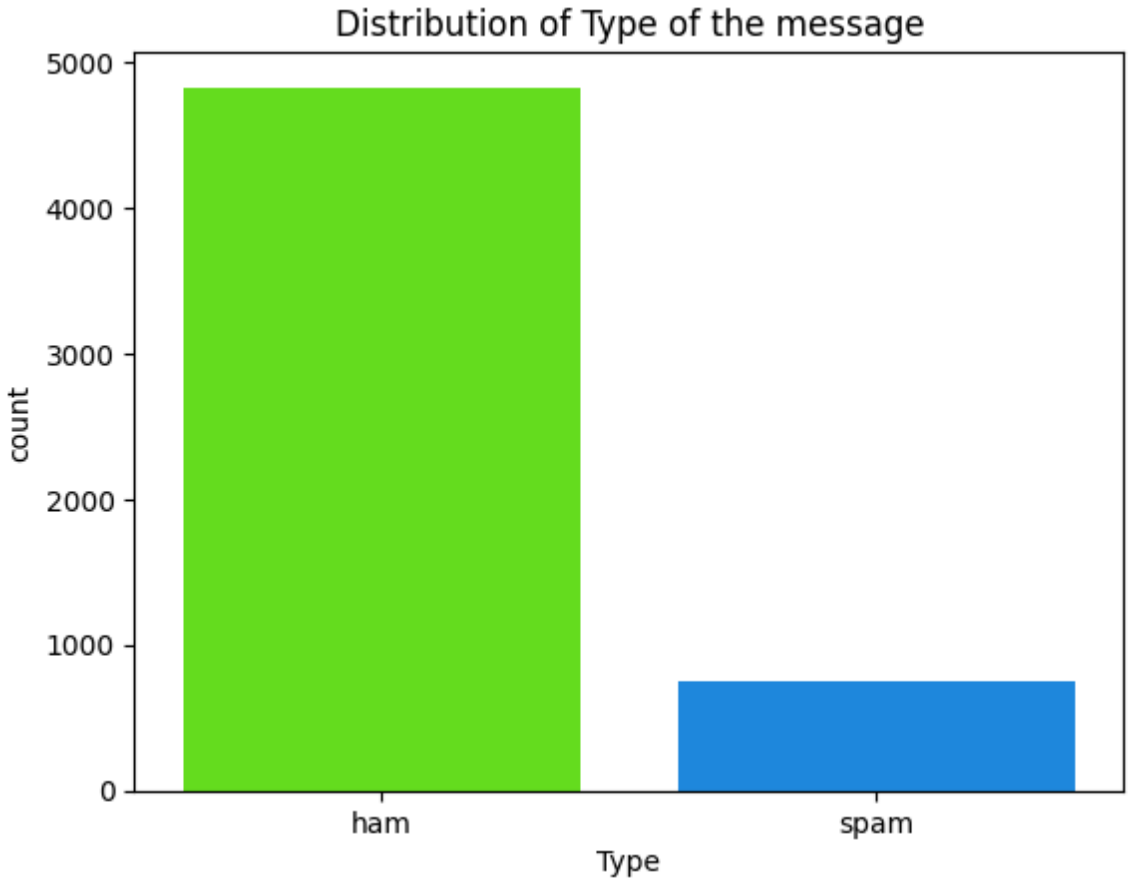
Out[6]:
```
Type       0
Content    0
dtype: int64
```

In [7]:
```
# Description of dataset
df.describe()
```

Out[7]:

	Type	Content
count	5572	5572
unique	2	5169
top	ham	Sorry, I'll call later
freq	4825	30

In [8]:
```
# Distribution of type of messages
ax = sns.countplot(x='Type',data=df,palette='gist_rainbow').set(title='Distribution of Type of the message')
plt.show()
```



In [9]:
```
# Percentage of Spam and Ham
ham = (df.Type.value_counts()[0]/5572)*100
spam = (df.Type.value_counts()[1]/5572)*100
print(f'Percentage of Ham in this dataset {ham.round(2)}%')
print(f'Percentage of Spam in this dataset {spam.round(2)}%')
```

```
Percentage of Ham in this dataset 86.59%
Percentage of Spam in this dataset 13.41%
```

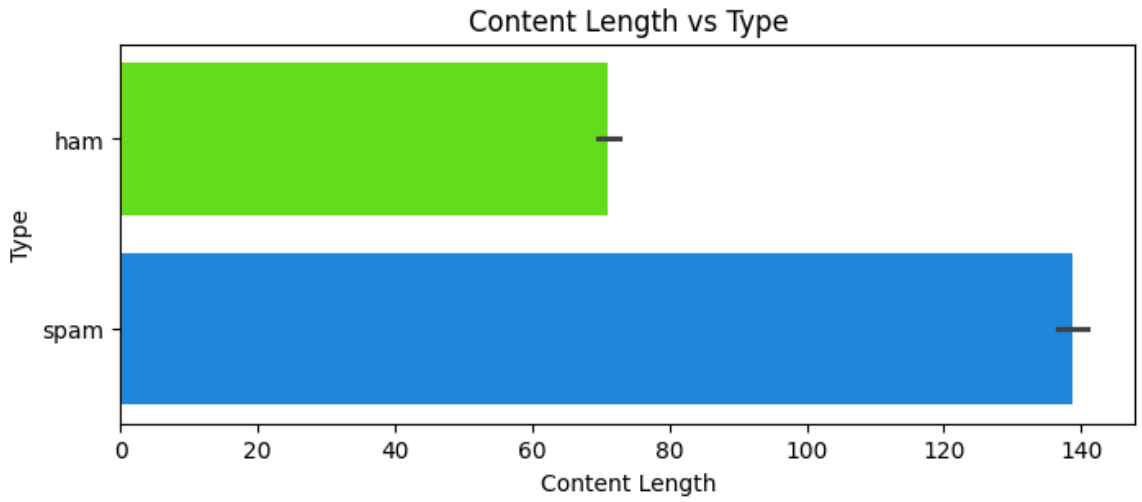
It Shows it's clearly imbalanced Data

In [10]:
```
# Length of the Content
df['Content Length'] = df['Content'].apply(len)
df.head()
```

Out[10]:

	Type	Content	Content Length
0	ham	Go until jurong point, crazy.. Available only ...	111
1	ham	Ok lar... Joking wif u oni...	29
2	spam	Free entry in 2 a wkly comp to win FA Cup fina...	155
3	ham	U dun say so early hor... U c already then say...	49
4	ham	Nah I don't think he goes to usf, he lives aro...	61

In [11]:
```
# Content Length vs Type
figsize = (8, 3)
plt.figure(figsize=figsize)
sns.barplot(df, x='Content Length', y='Type', palette='gist_rainbow').set(t
itle='Content Length vs Type')
plt.show()
```



From Above plot we can see **spam** messages are high in length compared to **ham** messages

Text Preprocessing

In [ ]:
```
# Encoding of Type Column
le = LabelEncoder()
le.fit(df['Type'])
df['Encoded Type'] = le.transform(df['Type'])
```

In [ ]:
```
# spliting the data
X = df['Content']
y = df['Encoded Type']
```

In [ ]:
```
# Vectorization on description column using Tf idf Vectorizer
vectorizer = TfidfVectorizer()
x = vectorizer.fit_transform(X)
x_vector = x.toarray()
```

In [ ]:
```
# DataFrame after Vectorization
pd.DataFrame(data=x_vector,columns=vectorizer.get_feature_names_out()).head
()
```

Out[ ]:

	00	000	000pes	008704050406	0089	0121	01223585236	01223585334	0125698789	02
0	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	0.0
2	0.0	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	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

5 rows × 8672 columns

In [ ]:
```
# Train Test split
X_train,X_test,y_train,y_test = train_test_split(x_vector,y,test_size=0.2,r
andom_state=0)
X_train.shape
```

Out[ ]:
```
(4457, 8672)
```

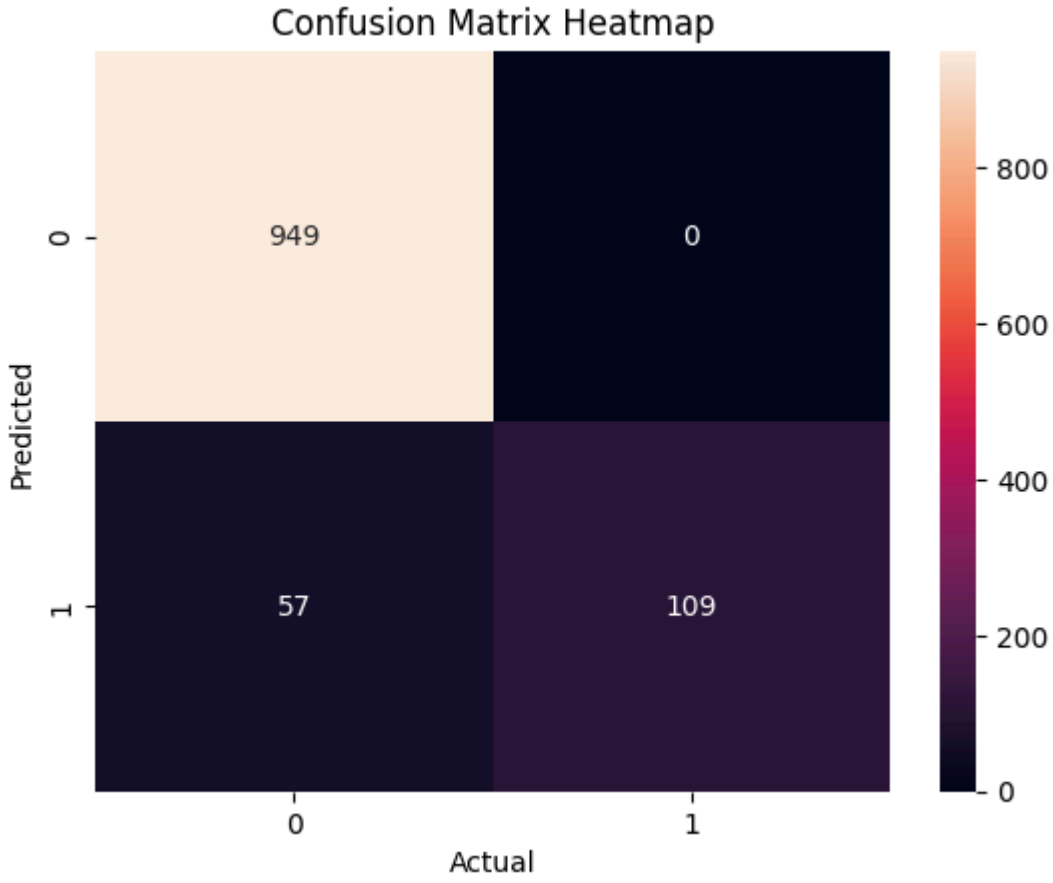
Model Building

1) Naive Bayes

In [ ]:
```
model_MNB = MultinomialNB()
model_MNB.fit(X_train,y_train)
print('Training set Score :',model_MNB.score(X_train,y_train))
print('Test set Score :',model_MNB.score(X_test,y_test))
```

```
Training set Score : 0.9699349338119811
Test set Score : 0.9488789237668162
```

In [ ]:
```
# Confusion Matrix
y_pred = model_MNB.predict(X_test)
cm = confusion_matrix(y_test,y_pred)
sns.heatmap(cm,annot=True,fmt='.0f').set(title='Confusion Matrix Heatmap')
plt.xlabel('Actual')
plt.ylabel('Predicted')
plt.show()
```



In [ ]:
```
# Classification Report
cr = classification_report(y_test,y_pred)
print(cr)
```

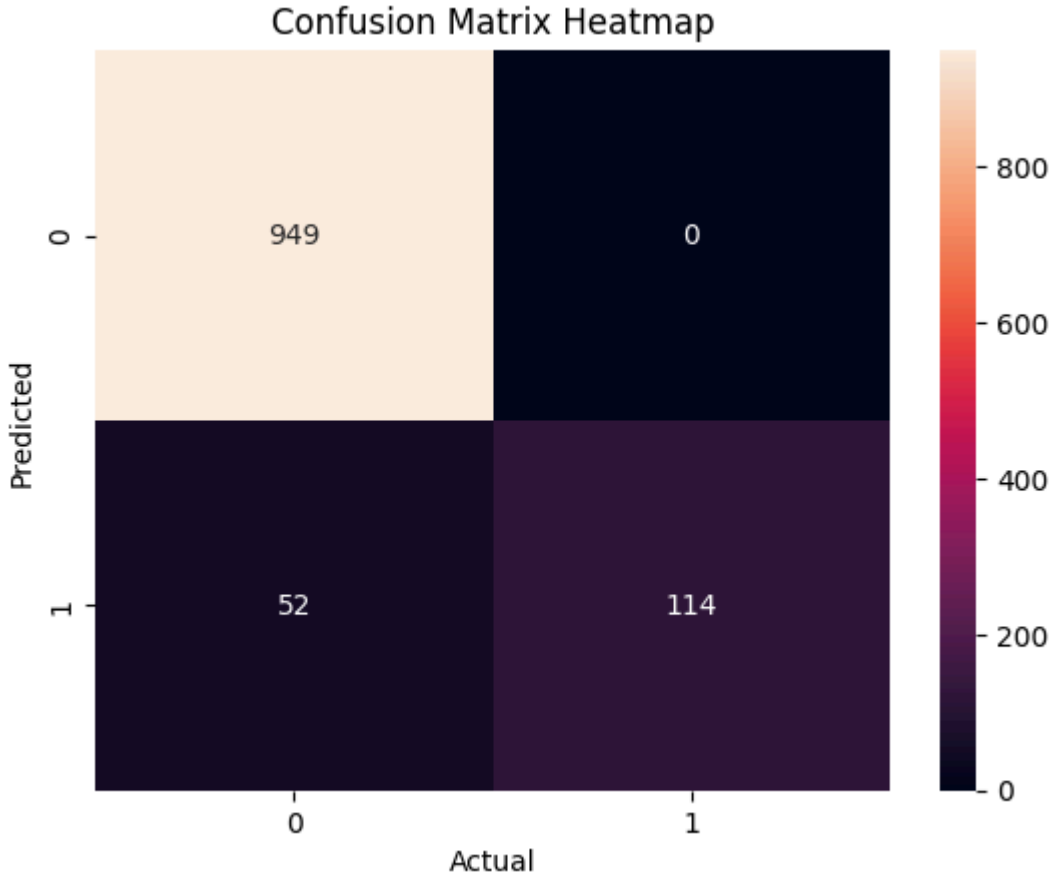
```
              precision    recall  f1-score   support

           0       0.94      1.00      0.97       949
           1       1.00      0.66      0.79       166

    accuracy                           0.95      1115
   macro avg       0.97      0.83      0.88      1115
weighted avg       0.95      0.95      0.94      1115
```

2) Logistic Regression

In [ ]:
```
model_lr = LogisticRegression()
model_lr.fit(X_train,y_train)
print('Training set Score :',model_lr.score(X_train,y_train))
print('Test set Score :',model_lr.score(X_test,y_test))
```

```
Training set Score : 0.9741978909580435
Test set Score : 0.9533632286995516
```

In [ ]:
```
# Confusion Matrix
y_pred = model_lr.predict(X_test)
cm = confusion_matrix(y_test,y_pred)
sns.heatmap(cm,annot=True,fmt='.0f').set(title='Confusion Matrix Heatmap')
plt.xlabel('Actual')
plt.ylabel('Predicted')
plt.show()
```



In [ ]:
```
# Classification Report
cr = classification_report(y_test,y_pred)
print(cr)
```

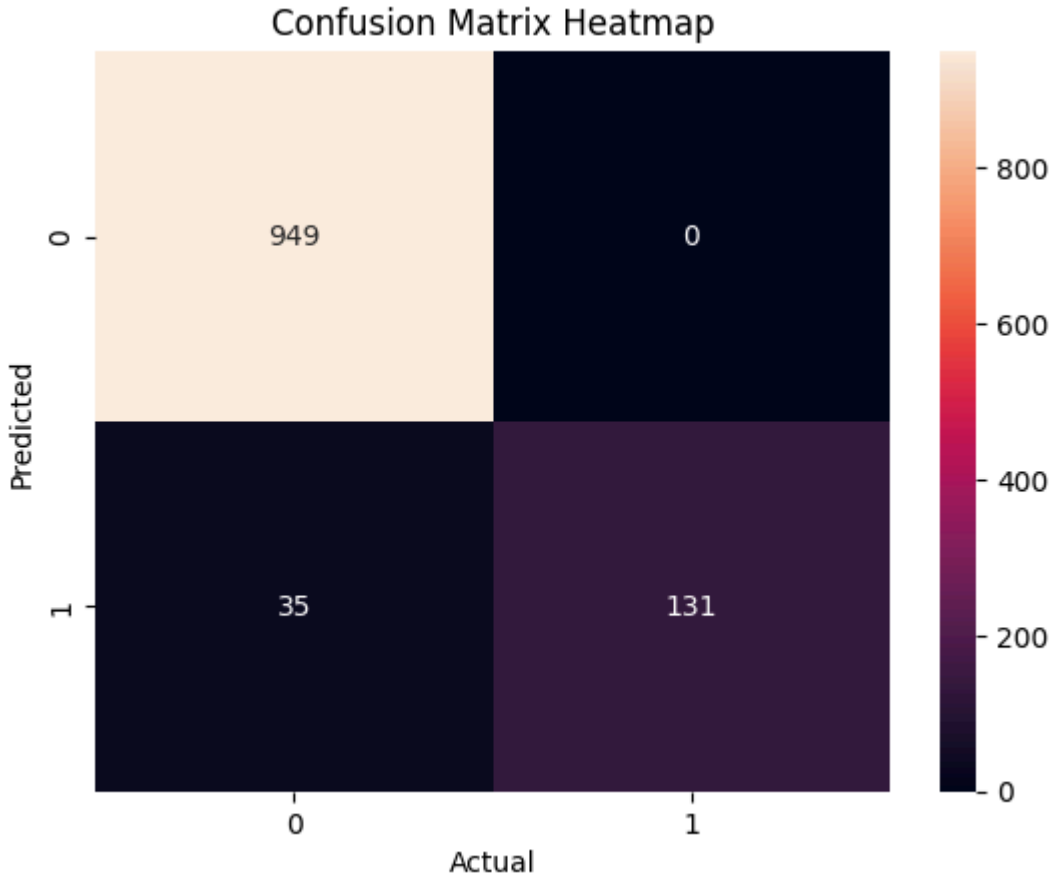
```
              precision    recall  f1-score   support

           0       0.94      1.00      0.97       949
           1       1.00      0.66      0.79       166

    accuracy                           0.95      1115
   macro avg       0.97      0.83      0.88      1115
weighted avg       0.95      0.95      0.94      1115
```

3) SVM

In [ ]:
```
model_svm = SVC()
model_svm.fit(X_train,y_train)
print('Training set Score :',model_svm.score(X_train,y_train))
print('Test set Score :',model_svm.score(X_test,y_test))
```

```
Training set Score : 0.9973076060130133
Test set Score : 0.968609865470852
```

In [ ]:
```
# Confusion Matrix
y_pred = model_svm.predict(X_test)
cm = confusion_matrix(y_test,y_pred)
sns.heatmap(cm,annot=True,fmt='.0f').set(title='Confusion Matrix Heatmap')
plt.xlabel('Actual')
plt.ylabel('Predicted')
plt.show()
```



In [ ]:
```
# Classification Report
cr = classification_report(y_test,y_pred)
print(cr)
```

```
              precision    recall  f1-score   support

           0       0.95      1.00      0.97       949
           1       1.00      0.69      0.81       166

    accuracy                           0.95      1115
   macro avg       0.97      0.84      0.89      1115
weighted avg       0.96      0.95      0.95      1115
```

Prediction

In [ ]:
```
text = ['Bored housewives! Chat n date now! 0871750.77.11! BT-national rate 10p/min only from landlines!',
        'Let Ur Heart Be Ur Compass Ur Mind Ur Map Ur Soul Ur Guide And U Will Never loose in world....gnun - Sent via WAY2SMS.COM']
# Actual ===> text = [1(spam),0(ham)]
```

In [ ]:
```
test = vectorizer.transform(text)
test_dense = test.toarray()
```

In [ ]:
```
# MultinomialNB
model_MNB.predict(test_dense)
```

Out[ ]:
```
array([1, 0])
```

In [ ]:
```
# Logistic Regression
model_lr.predict(test_dense)
```

Out[ ]:
```
array([1, 0])
```

In [ ]:
```
# SVM
model_svm.predict(test_dense)
```

Out[ ]:
```
array([1, 0])
```