

Importing the Libraries

```
import numpy as np
import pandas as pd
from sklearn.model_selection import train_test_split
from sklearn.feature_extraction.text import TfidfVectorizer
from sklearn.linear_model import LogisticRegression
from sklearn.metrics import accuracy_score
```

Data Collection & Pre-Processing

Loading the data from csv file to a pandas Dataframe

```
raw_mail_data = pd.read_csv('/content/spam.csv', encoding = "ISO-8859-1")
```

```
print(raw_mail_data)
```

```
      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 I_ 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]
```

replace the null values with a null string

```
mail_data = raw_mail_data.where((pd.notnull(raw_mail_data)), '')
```

printing the first 5 rows of the dataframe

```
mail_data.head()
```

```

      v1
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...

```

```

      v2 Unnamed: 2 \

```

```

0
1
2
3
4

```

```

# checking the number of rows and columns in the dataframe
mail_data.shape

```

```

(5572, 5)

```

Label Encoding

```

# label spam mail as 0; ham mail as 1;

```

```

mail_data.loc[mail_data['v1'] == 'spam', 'v1',] = 0
mail_data.loc[mail_data['v1'] == 'ham', 'v1',] = 1

```

```

spam - 0

```

```

ham - 1

```

```

# separating the data as texts and label

```

```

X = mail_data['v2']

```

```

Y = mail_data['v1']

```

```

print(X)

```

```

0      Go until jurong point, crazy.. Available only ...
1      Ok lar... Joking wif u oni...
2      Free entry in 2 a wkly comp to win FA Cup fina...
3      U dun say so early hor... U c already then say...
4      Nah I don't think he goes to usf, he lives aro...
      ...
5567   This is the 2nd time we have tried 2 contact u...
5568           Will I_ b going to esplanade fr home?
5569   Pity, * was in mood for that. So...any other s...
5570   The guy did some bitching but I acted like i'd...
5571           Rofl. Its true to its name
Name: v2, Length: 5572, dtype: object

```

```

print(Y)

```

```

0      1
1      1
2      0
3      1
4      1
..
5567   0
5568   1
5569   1
5570   1
5571   1
Name: v1, Length: 5572, dtype: object

```

Splitting the data into training data & test data

```
X_train, X_test, Y_train, Y_test = train_test_split(X, Y, test_size=0.2, random_state=3)
```

```

print(X.shape)
print(X_train.shape)
print(X_test.shape)

```

```

(5572,)
(4457,)
(1115,)

```

Feature Extraction

transform the text data to feature vectors that can be used as input to the Logistic regression

```
feature_extraction = TfidfVectorizer(min_df = 1, stop_words='english', lowercase='True')
```

```

X_train_features = feature_extraction.fit_transform(X_train)
X_test_features = feature_extraction.transform(X_test)

```

convert Y_train and Y_test values as integers

```

Y_train = Y_train.astype('int')
Y_test = Y_test.astype('int')

```

```
print(X_train)
```

```

3075    Mum, hope you are having a great day. Hoping t...
1787                                     Yes:)sura in sun tv.:)lol.
1614    Me sef dey laugh you. Meanwhile how's my darli...
4304                Yo come over carlos will be here soon
3266                Ok then i come n pick u at engin?
...
789                Gud mrng dear hav a nice day

```

```
968             Are you willing to go for aptitude class.
1667    So now my dad is gonna call after he gets out ...
3321    Ok darlin i supose it was ok i just worry too ...
1688             Nan sonathaya soladha. Why boss?
Name: v2, Length: 4457, dtype: object
```

```
print(X_train_features)
```

```
(0, 741) 0.3219352588930141
(0, 3979) 0.2410582143632299
(0, 4296) 0.3891385935794867
(0, 6599) 0.20296878731699391
(0, 3386) 0.3219352588930141
(0, 2122) 0.38613577623520473
(0, 3136) 0.440116181574609
(0, 3262) 0.25877035357606315
(0, 3380) 0.21807195185332803
(0, 4513) 0.2909649098524696
(1, 4061) 0.380431198316959
(1, 6872) 0.4306015894277422
(1, 6417) 0.4769136859540388
(1, 6442) 0.5652509076654626
(1, 7443) 0.35056971070320353
(2, 933) 0.4917598465723273
(2, 2109) 0.42972812260098503
(2, 3917) 0.40088501350982736
(2, 2226) 0.413484525934624
(2, 5825) 0.4917598465723273
(3, 6140) 0.4903863168693604
(3, 1599) 0.5927091854194291
(3, 1842) 0.3708680641487708
(3, 7453) 0.5202633571003087
(4, 2531) 0.7419319091456392
:
(4452, 2122) 0.31002103760284144
(4453, 999) 0.6760129013031282
(4453, 7273) 0.5787739591782677
(4453, 1762) 0.45610005640082985
(4454, 3029) 0.42618909997886
(4454, 2086) 0.3809693742808703
(4454, 3088) 0.34475593009514444
(4454, 2001) 0.4166919007849217
(4454, 1049) 0.31932060116006045
(4454, 7346) 0.31166263834107377
(4454, 5370) 0.42618909997886
(4455, 1148) 0.38998123077430413
(4455, 6433) 0.38998123077430413
(4455, 6361) 0.25697343671652706
(4455, 2764) 0.3226323745940581
(4455, 7358) 0.2915949626395065
```

```
(4455, 7407)    0.3028481995557642
(4455, 2108)    0.3136468384526087
(4455, 4251)    0.30616657078392584
(4455, 3763)    0.16807158405536876
(4455, 4773)    0.35860460546223444
(4456, 6117)    0.5304350313291551
(4456, 6133)    0.5304350313291551
(4456, 1386)    0.4460036316446079
(4456, 4557)    0.48821933148688146
```

Training the Model

Logistic Regression

```
model = LogisticRegression()
```

```
# training the Logistic Regression model with the training data
model.fit(X_train_features, Y_train)
```

```
LogisticRegression()
```

Evaluating the trained model

```
# prediction on training data
```

```
prediction_on_training_data = model.predict(X_train_features)
accuracy_on_training_data = accuracy_score(Y_train, prediction_on_training_data)
```

```
print('Accuracy on training data : ', accuracy_on_training_data)
```

```
Accuracy on training data :  0.9661207089970832
```

```
# prediction on test data
```

```
prediction_on_test_data = model.predict(X_test_features)
accuracy_on_test_data = accuracy_score(Y_test, prediction_on_test_data)
```

```
print('Accuracy on test data : ', accuracy_on_test_data)
```

```
Accuracy on test data :  0.9623318385650225
```

Building a Predictive System

```
input_mail = ["I've been searching for the right words to thank you for this
breather. I promise i wont take your help for granted and will fulfil my promise. You have been wonderful and a blessing at all times"]
```

```
# convert text to feature vectors
```

```
input_data_features = feature_extraction.transform(input_mail)
```

```
# making prediction
```

```
prediction = model.predict(input_data_features)
print(prediction)
```

```
if (prediction[0]==1):
    print('Ham mail')
```

```
else:
    print('Spam mail')
```

```
[1]
Ham mail
```