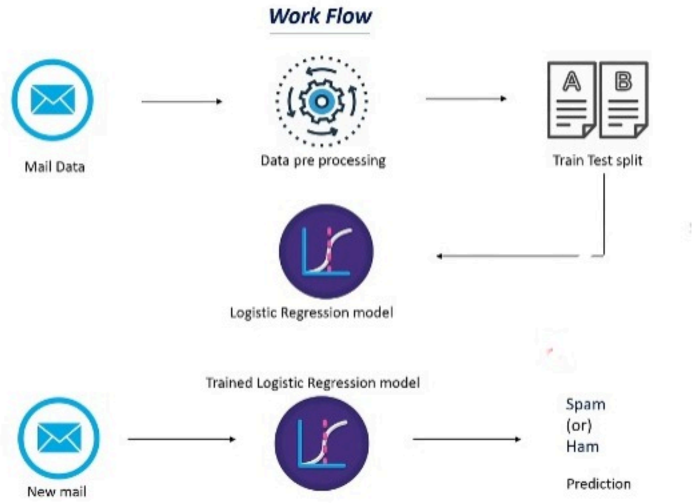
E-Mail Spam Detection

The goal is to automatically categorize incoming emails as either “spam” or “ham” (legitimate) based on their content.

Dataset link: Data



```
#importing all wanted libraries
import pandas as pd#for data frame
import numpy as np#for matrix calculations
from sklearn.model_selection import train_test_split#for train the model
from sklearn.feature_extraction.text import TfidfVectorizer
#convertion of txt -> num
from sklearn.linear_model import LogisticRegression#for probability test
from sklearn.metrics import accuracy_score, precision_score, recall_score, f1_score
from sklearn.metrics import classification_report#for overall report
```

Data Collection and pre-processing

```
#loading the data
data= pd.read_csv('/content/mail_data.csv', encoding='latin-1')
```

```
data.head()
```

	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...

```
data.shape
```

```
(5572, 2)
```

```
data.values
```

```
array([['ham',
        'Go until jurong point, crazy.. Available only in bugis n great world la e buffet... Cine there got amore wat...'],
       ['ham', 'Ok lar... Joking wif u oni...'],
       ['spam',
        "Free entry in 2 a wkly comp to win FA Cup final tkts 21st May 2005. Text FA to 87121 to receive entry question(std txt
rate)T&C's apply 08452810075over18's"],
       ...,
       ['ham',
        'Pity, * was in mood for that. So...any other suggestions?'],
       ['ham',
        "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"],
       ['ham', 'Rofl. Its true to its name']], dtype=object)
```

```
data.describe()
```

	Category	Message
count	5572	5572
unique	2	5157
top	ham	Sorry, I'll call later
freq	4825	30

```
data.info()
```

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

```
data.isnull().sum()
```

	0
Category	0
Message	0

dtype: int64

```
data.drop_duplicates(inplace=True)
data
```

	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...
...	...	...
5567	spam	This is the 2nd time we have tried 2 contact u...
5568	ham	Will Ã¼ 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

5157 rows × 2 columns

replacing the null values with empty string

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

```
      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...
...        ...                                                ...
5567      spam  This is the 2nd time we have tried 2 contact u...
5568       ham               Will Ã¼ 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
5157 rows × 2 columns
```

Label Encoding

- 0 -> spam mail
- 1 -> ham mail

```
#labelling the spam and ham mails
mail_data.loc[mail_data['Category']=='spam','category']=0
mail_data.loc[mail_data['Category']=='ham','category']=1
mail_data.head()
```

```
   Category                                          Message  category
0       ham  Go until jurong point, crazy.. Available only ...       1.0
1       ham                      Ok lar... Joking wif u oni...       1.0
2      spam  Free entry in 2 a wkly comp to win FA Cup fina...       0.0
3       ham  U dun say so early hor... U c already then say...       1.0
4       ham  Nah I don't think he goes to usf, he lives aro...       1.0
```

seperating the data into text and lables

```
X = mail_data['Category']
Y = mail_data['category']
X
Y
```

	category
0	1.0
1	1.0
2	0.0
3	1.0
4	1.0
...	...
5567	0.0
5568	1.0
5569	1.0
5570	1.0
5571	1.0

5157 rows × 1 columns

dtype: float64

Training the model

splitting the data into:

- Train 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,X_train.shape,X_test.shape)
```

```
(5157,) (4125,) (1032,)
```

Feature Extraction

```
#transorming into 0s and 1s
feature_extraction=TfidfVectorizer(min_df=1,stop_words='english',lowercase=True) # Changed 'True' to True
feauture_X_train=feature_extraction.fit_transform(X_train)
feature_X_test=feature_extraction.transform(X_test)
```

converting y_test and y_train values as 'int'

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

	category
1786	1
3576	1
420	0
5156	1
3354	1
...	...
809	1
993	1
1726	1
3525	1
1748	1

4125 rows × 1 columns

dtype: int64

Training by the logistic regression model

```
#Creating a model
model = LogisticRegression()
```

```
#loading the data into the model
model.fit(feauture_X_train,Y_train)
model
```

```
▾ LogisticRegression
LogisticRegression()
```

```
#Evaluating the trained model
prediction_on_training_data = model.predict(feauture_X_train)
accuracy_on_training_data = accuracy_score(Y_train, prediction_on_training_data)
print("accuracy on trained data: ",accuracy_on_training_data)
```

```
accuracy on trained data:  1.0
```

```
#Evaluating the trained model
prediction_on_test_data = model.predict(feature_X_test)
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:  1.0
```

```
input_mail = input("Enter the mail: ")

# Convert the input mail to a feature vector
input_mail_features = feature_extraction.transform([input_mail])

# Make prediction using the trained model
prediction = model.predict(input_mail_features)[0]

if prediction == 1:
  print("This mail is a ham mail.")
else:
  print("This mail is a spam mail.")

```

```
Enter the mail: A new sign-in on Windows personalaccdinesh@gmail.com We noticed a new sign-in to your Google Account on a Windows
This mail is a ham mail.
```

```
input_mail = input("Enter the mail: ")

# Convert the input mail to a feature vector
# The input to the transform method needs to be a list
input_mail_features = feature_extraction.transform([input_mail]

# Make prediction using the trained model
prediction = model.predict(input_mail_features)

if (prediction[0]) == 1:
  print("This mail is a spam mail.")
else:
  print("This mail is a ham mail.")
```

```
Enter the mail: Free video camera phones with Half Price line rental for 12 mths and 500 cross ntwk mins 100 txts. Call MobileUpd8
This mail is a spam mail.
```