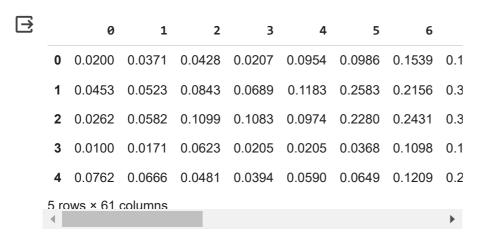
## Importing the dependencies

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

## Data Collection and Data processing

# loading the dataset into pandas Dataframe
sonar\_data=pd.read\_csv('/content/sonar data.csv',header=None)

sonar\_data.head()



# number of rows and columns
sonar\_data.shape

(208, 61)

# deriving some statistical measures of the data sonar\_data.describe()

```
sonar_data[60].value_counts()
                          111
            М
             R
                            97
             Name: 60, dtype: int64
M --> Mine
R --> Rock
                                       . . . . . . .
                                                                     . . . . . . .
                                                                                                  - -- ---
sonar_data.groupby(60).mean()
                                          0
                                                                   1
                                                                                            2
                                                                                                                                                                                               6
                                                                                                                                                                                                                       7
                                                                                                                    3
                                                                                                                                             4
                                                                                                                                                                      5
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               60
                         0.034989 0.045544 0.050720 0.064768 0.086715 0.111864 0.128359 0.149832 0.213492
                                                                                                                                                                                                                                                       0.2
                М
                         0.022498 \quad 0.030303 \quad 0.035951 \quad 0.041447 \quad 0.062028 \quad 0.096224 \quad 0.114180 \quad 0.117596 \quad 0.137392 \quad 0.118181 \quad 0.018181 \quad 0.0181811 \quad 0.018181 \quad 0.018181
             2 rows × 60 columns
 seperating data and label columns
X=sonar_data.drop(columns=60,axis=1)
Y=sonar_data[60]
print(X)
                                    0
                                                          1
                                                                              2
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                                                                   0.1099
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                                                            0.0232 0.0027
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                                                            0.0042 0.0086 0.0046
             206
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                                                                                                                          0.0047
                                                                                                                                               0.0039 0.0061
                                    57
                                                          58
                                                                               59
```

0.0084 0.0090 0.0032

```
0.0049 0.0052 0.0044
    1
     2
         0.0164 0.0095 0.0078
    3
         0.0044 0.0040 0.0117
    4
         0.0048 0.0107 0.0094
                  . . .
    203 0.0115 0.0193 0.0157
    204 0.0032 0.0062 0.0067
    205 0.0138 0.0077 0.0031
     206 0.0079 0.0036 0.0048
    207 0.0036 0.0061 0.0115
    [208 rows x 60 columns]
print(Y)
    0
           R
    1
           R
    2
           R
    3
           R
    4
           R
    203
           Μ
     204
    205
           Μ
    206
           Μ
    207
    Name: 60, Length: 208, dtype: object
Training and testing data
X_train,X_test,Y_train,Y_test=train_test_split(X,Y,test_size=0.1,stratify=Y,random_state=1)
print(X.shape,X_train.shape,X_test.shape)
     (208, 60) (187, 60) (21, 60)
Model Training --> Logistic Regression
model=LogisticRegression()
#traning the LR model with training data
model.fit(X_train,Y_train)
     ▼ LogisticRegression
     LogisticRegression()
Model Evaluation
#accuracy on training data
X_train_prediction = model.predict(X_train)
training_data_accuracy = accuracy_score(X_train_prediction,Y_train)
```

```
print('Accuracy on training data :',training_data_accuracy)
             Accuracy on training data: 0.8342245989304813
# accuracy on testing data
X_test_prediction = model.predict(X_test)
testing_data_accuracy = accuracy_score(X_test_prediction,Y_test)
print("Accuracy on testing data: ",testing_data_accuracy)
             Accuracy on testing data: 0.7619047619047619
 Making a predictive System
input_data=(0.0124,0.0433,0.0604,0.0449,0.0597,0.0355,0.0531,0.0343,0.1052,0.2120,0.1640,0.1901,6
# changing input_data into array
input_data_as_array = np.asarray(input_data)
# reshaping the np array as we are predicting for only one instance
input_data_reshaped = input_data_as_array.reshape(1,-1)
prediction=model.predict(input_data_reshaped)
print(prediction)
if (prediction[0]=='R'):
     print("Input data belongs to rock")
else:
     print("Input data belongs to mine")
             ['R']
             Input data belongs to rock
input_data1=[(0.0124,0.0433,0.0604,0.0449,0.0597,0.0355,0.0531,0.0343,0.1052,0.2120,0.1640,0.1901
                                  (0.0210, 0.0121, 0.0203, 0.1036, 0.1675, 0.0418, 0.0723, 0.0828, 0.0494, 0.0686, 0.1125, 0.1741, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0686, 0.0
input_data1_as_array = np.asarray(input_data1)
input_data1_reshaped= input_data1_as_array.reshape(2,-1)
prediction1= model.predict(input_data1_reshaped)
print(prediction1)
             ['R' 'M']
```