```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.linear_model import LogisticRegression
from sklearn.model_selection import train_test_split
from sklearn.metrics import confusion_matrix, multilabel_confusion_matrix # multilable for >>> Multiclass Classification
from sklearn.metrics import classification_report, accuracy_score
from sklearn.metrics import roc_curve,roc_auc_score
import warnings # To avoid warning message...Which is shown bcz of New Upate of Python
warnings.filterwarnings("ignore")
import pickle
```

```
#1.Problem statement
#To predict person is survived or not using variuos variables
```

```
#2.Data Gathering
df = pd.read_csv("/content/titanic.csv")
df.head().T
```

	0	1	2	3
PassengerId	1	2	3	4
Survived	0	1	1	1
Pclass	3	1	3	1
Name	Braund, Mr. Owen Harris	Cumings, Mrs. John Bradley (Florence Briggs Th...	Heikkinen, Miss. Laina	Futrelle, Mrs. Jacques Heath (Lily May Peel)
Gender	male	female	female	female
Age	22.0	38.0	26.0	35.0
SibSp	1	1	0	1
Parch	0	0	0	0
Ticket	A/5 21171	PC 17599	STON/O2. 3101282	113803
Fare	7.25	71.2833	7.925	53.1
Cabin	NaN	C85	NaN	C123
Embarked	S	C	S	S

```
df['Embarked'].unique()
```

```
array(['S', 'C', 'Q', nan], dtype=object)
```

```
#3.EDA
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 891 entries, 0 to 890
Data columns (total 12 columns):
 #   Column       Non-Null Count  Dtype
---  ------       --------------  -----
 0   PassengerId  891 non-null    int64
 1   Survived     891 non-null    int64
 2   Pclass       891 non-null    int64
 3   Name         891 non-null    object
 4   Gender       891 non-null    object
 5   Age          714 non-null    float64
 6   SibSp        891 non-null    int64
 7   Parch        891 non-null    int64
 8   Ticket       891 non-null    object
 9   Fare         891 non-null    float64
 10  Cabin        204 non-null    object
 11  Embarked     889 non-null    object
```

```
dtypes: float64(2), int64(5), object(5)
memory usage: 83.7+ KB
```

```
df.nunique()
```

```
PassengerId    891
Survived         2
Pclass           3
Name           891
Gender           2
Age             88
SibSp            7
Parch            7
Ticket         681
Fare           248
Cabin          147
Embarked         3
dtype: int64
```

```
column_list=['PassengerId','Name','Ticket','Cabin'] # These columns drop bcz of maximum no of Unique Values and object data type
df.drop(column_list,axis=1,inplace=True)
```

```
from sklearn.preprocessing import LabelEncoder
le = LabelEncoder()
le.fit(df['Gender'])
df['Gender'] = le.transform(df['Gender'])
le.fit(df['Embarked'])
df['Embarked'] = le.transform(df['Embarked'])
df.head().T
```

	0	1	2	3	4
Survived	0.00	1.0000	1.000	1.0	0.00
Pclass	3.00	1.0000	3.000	1.0	3.00
Gender	1.00	0.0000	0.000	0.0	1.00
Age	22.00	38.0000	26.000	35.0	35.00
SibSp	1.00	1.0000	0.000	1.0	0.00
Parch	0.00	0.0000	0.000	0.0	0.00
Fare	7.25	71.2833	7.925	53.1	8.05
Embarked	2.00	0.0000	2.000	2.0	2.00

```
df['Embarked'].unique()
```

```
array([2, 0, 1, 3])
```

```
df.isna().sum()
```

```
Survived      0
Pclass        0
Gender        0
Age         177
SibSp         0
Parch         0
Fare          0
Embarked      0
dtype: int64
```

```
df['Age'].fillna(df['Age'].median(),inplace=True)
```

```
df.isna().sum()
```

```
Survived    0
Pclass      0
Gender      0
Age         0
SibSp       0
Parch       0
```

```
Fare        0
Embarked    0
dtype: int64
```

```
##feature selection
x = df.drop("Survived",axis=1)
y = df['Survived']
x_train,x_test,y_train,y_test= train_test_split(x,y,test_size=0.25,random_state=42,stratify=y)
```

```
lr_clf = LogisticRegression()
lr_clf.fit(x_train,y_train)
```

▾ LogisticRegression
LogisticRegression()

```
#Evaluation
y_pred = lr_clf.predict(x_test)
y_pred[20:25] # Y predicted
```

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

```
y_test[20:25] # y actual
```

```
288    1
21     1
139    0
556    1
562    0
Name: Survived, dtype: int64
```

```
###Accuracy
cnf_matrix = confusion_matrix(y_test,y_pred)
print("Confusion matrix:\n",cnf_matrix)
```

```
Confusion matrix:
 [[110  27]
 [ 24  62]]
```

```
clf_report = classification_report(y_test,y_pred)
print("classification_report is :\n",clf_report)
```

```
classification_report is :
               precision    recall  f1-score   support

           0       0.82      0.80      0.81       137
           1       0.70      0.72      0.71        86

    accuracy                           0.77       223
   macro avg       0.76      0.76      0.76       223
weighted avg       0.77      0.77      0.77       223
```

```
y_pred_prob = lr_clf.predict_proba(x_test)
y_pred_prob
```

```
            [0.17284264, 0.82715736],
            [0.47781668, 0.52218332],
            [0.08673712, 0.91326288],
            [0.69645801, 0.30354199],
            [0.56660506, 0.43339494],
            [0.52385023, 0.47614977],
            [0.06198393, 0.93801607],
            [0.77634407, 0.22365593],
            [0.09208953, 0.90791047],
            [0.94897231, 0.05102769],
            [0.86567921, 0.13432079],
            [0.89130401, 0.10869599],
            [0.59804404, 0.40195596],
            [0.48816336, 0.51183664],
            [0.90430524, 0.09569476],
            [0.06475713, 0.93524287],
            [0.88684875, 0.11315125],
            [0.0683676 , 0.9316324 ],
            [0.35857084, 0.64142916],
            [0.91632475, 0.08367525],
            [0.90029167, 0.09970833],
            [0.88053593, 0.11946407],
            [0.90005483, 0.09994517],
            [0.90033314, 0.09966686],
            [0.21633424, 0.78366576],
            [0.41355984, 0.58644016],
            [0.34513619, 0.65486381],
            [0.70654384, 0.29345616],
            [0.91633055, 0.08366945],
            [0.64598048, 0.35401952],
            [0.68265252, 0.31734748],
            [0.89133117, 0.10866883],
            [0.36579944, 0.63420056],
            [0.12489054, 0.87510946],
            [0.47551015, 0.52448985],
            [0.17458069, 0.82541931],
            [0.80478964, 0.19521036],
            [0.90029167, 0.09970833],
            [0.38164781, 0.61835219],
            [0.11328289, 0.88671711],
            [0.64905724, 0.35094276],
            [0.04140385, 0.95859615]])
```

```
fpr,tpr,thresh = roc_curve(y_test,y_pred_prob[:,1])
```

```
thresh
```

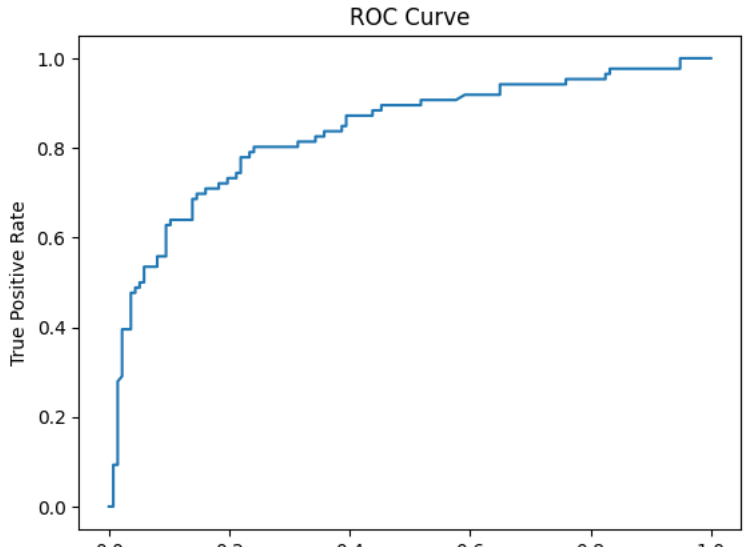
```
array([1.97764419, 0.97764419, 0.96765667, 0.96735423, 0.93634356,
       0.93524287, 0.86614056, 0.85313157, 0.80943277, 0.78366576,
       0.75231593, 0.74743985, 0.73618632, 0.72665254, 0.72128521,
       0.7147891 , 0.69911177, 0.68051976, 0.67393466, 0.65502985,
       0.65492375, 0.65487067, 0.65017564, 0.64142916, 0.63420056,
       0.61962753, 0.61835219, 0.60767844, 0.56748   , 0.5606194 ,
       0.55977222, 0.55233412, 0.53510613, 0.52218332, 0.52014209,
       0.50170843, 0.47763673, 0.44683191, 0.43971061, 0.43339494,
       0.39482924, 0.35609197, 0.35401952, 0.35094276, 0.32542233,
       0.29299107, 0.29111876, 0.26441129, 0.26221937, 0.25514933,
       0.25436715, 0.25428667, 0.25068454, 0.24526111, 0.22866881,
       0.22365593, 0.20418319, 0.17114008, 0.16338388, 0.15331459,
       0.14858949, 0.14261355, 0.14246546, 0.14033885, 0.13682442,
       0.11951504, 0.11946407, 0.10533624, 0.10393436, 0.10076571,
       0.09994517, 0.09970833, 0.09968317, 0.09958806, 0.09957787,
       0.09569476, 0.08374031, 0.08369674, 0.08367525, 0.08366945,
       0.05102769, 0.04655931, 0.02202393, 0.00917107])
```

ROC Curve

```
# @title ROC Curve
```

```
plt.title("ROC Curve")
plt.plot(fpr,tpr)
plt.xlabel("Flase Positive Rate")
plt.ylabel("True Positive Rate")
```

```
Text(0, 0.5, 'True Positive Rate')
```




```
#save the model
file = open("expense_model.pkl", 'wb')
pickle.dump(linreg, file)
```