Assignment 5

1. Implement logistic regression using Python/R to perform classification on Social_Network_Ads.csv dataset.
2. Compute Confusion matrix to find TP, FP, TN, FN, Accuracy, Error rate, Precision, Recall on the given dataset..

In [10]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
```

In [11]:
```
dataset=pd.read_csv("C:\\Users\\Admin\\Desktop\\Social_Network_Ads.csv")
```

In [12]:
```
print(dataset)
```

```
      User ID  Gender  Age  EstimatedSalary  Purchased
0    15624510    Male   19            19000          0
1    15810944    Male   35            20000          0
2    15668575  Female   26            43000          0
3    15603246  Female   27            57000          0
4    15804002    Male   19            76000          0
5    15728773    Male   27            58000          0
6    15598044  Female   27            84000          0
7    15694829  Female   32           150000          1
8    15600575    Male   25            33000          0
9    15727311  Female   35            65000          0
10   15570769  Female   26            80000          0
11   15606274  Female   26            52000          0
12   15746139    Male   20            86000          0
13   15704987    Male   32            18000          0
14   15628972    Male   18            82000          0
15   15697686    Male   29            80000          0
16   15733883    Male   47            25000          1
17   15617482    Male   45            26000          1
18   15704583    Male   46            28000          1
19   15621083  Female   48            29000          1
20   15649487    Male   45            22000          1
21   15736760  Female   47            49000          1
22   15714658    Male   48            41000          1
23   15599081  Female   45            22000          1
24   15705113    Male   46            23000          1
25   15631159    Male   47            20000          1
26   15792818    Male   49            28000          1
27   15633531  Female   47            30000          1
28   15744529    Male   29            43000          0
29   15669656    Male   31            18000          0
..        ...     ...  ...              ...        ...
370  15611430  Female   60            46000          1
371  15774744    Male   60            83000          1
372  15629885  Female   39            73000          0
373  15708791    Male   59           130000          1
374  15793890  Female   37            80000          0
375  15646091  Female   46            32000          1
376  15596984  Female   46            74000          0
377  15800215  Female   42            53000          0
378  15577806    Male   41            87000          1
379  15749381  Female   58            23000          1
380  15683758    Male   42            64000          0
381  15670615    Male   48            33000          1
382  15715622  Female   44           139000          1
383  15707634    Male   49            28000          1
384  15806901  Female   57            33000          1
385  15775335    Male   56            60000          1
386  15724150  Female   49            39000          1
387  15627220    Male   39            71000          0
388  15672330    Male   47            34000          1
389  15668521  Female   48            35000          1
390  15807837    Male   48            33000          1
391  15592570    Male   47            23000          1
392  15748589  Female   45            45000          1
393  15635893    Male   60            42000          1
394  15757632  Female   39            59000          0
395  15691863  Female   46            41000          1
396  15706071    Male   51            23000          1
397  15654296  Female   50            20000          1
398  15755018    Male   36            33000          0
399  15594041  Female   49            36000          1

[400 rows x 5 columns]
```

In [13]:
```
dataset.isnull().sum()
```

Out[13]:
```
User ID            0
Gender             0
Age                0
EstimatedSalary    0
Purchased          0
dtype: int64
```

In [14]:
```
X = dataset.iloc[:, [2, 3]].values
y = dataset.iloc[:, 4].values
```

In [17]:
```
from sklearn.model_selection import train_test_split
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size = 0.25, random_state = 0)
```

In [18]:
```
print(X_train[:3])
print('-'*15)
print(y_train[:3])
print('-'*15)
print(X_test[:3])
print('-'*15)
print(y_test[:3])
```

```
[[    44  39000]
 [    32 120000]
 [    38  50000]]
---------------
[0 1 0]
---------------
[[   30 87000]
 [   38 50000]
 [   35 75000]]
---------------
[0 0 0]
```

In [19]:
```
from sklearn.preprocessing import StandardScaler
sc_X = StandardScaler()
X_train = sc_X.fit_transform(X_train)
X_test = sc_X.transform(X_test)
```

```
C:\ProgramData\Anaconda3\lib\site-packages\sklearn\utils\validation.py:475: DataConversionWarning: Data with input dtype int6
4 was converted to float64 by StandardScaler.
  warnings.warn(msg, DataConversionWarning)
```

In [20]:
```
print(X_train[:3])
print('-'*15)
print(X_test[:3])
```

```
[[ 0.58164944 -0.88670699]
 [-0.60673761  1.46173768]
 [-0.01254409 -0.5677824 ]]
---------------
[[-0.80480212  0.50496393]
 [-0.01254409 -0.5677824 ]
 [-0.30964085  0.1570462 ]]
```

In [21]:
```
from sklearn.linear_model import LogisticRegression
classifier = LogisticRegression(random_state = 0, solver='lbfgs' )
classifier.fit(X_train, y_train)
y_pred = classifier.predict(X_test)

print(X_test[:10])
```

```
[[-0.80480212  0.50496393]
 [-0.01254409 -0.5677824 ]
 [-0.30964085  0.1570462 ]
 [-0.80480212  0.27301877]
 [-0.30964085 -0.5677824 ]
 [-1.10189888 -1.43757673]
 [-0.70576986 -1.58254245]
 [-0.21060859  2.15757314]
 [-1.99318916 -0.04590581]
 [ 0.8787462  -0.77073441]]
```

In [22]:
```
print('-'*15)
print(y_pred[:10])
```

```
---------------
[0 0 0 0 0 0 0 1 0 1]
```

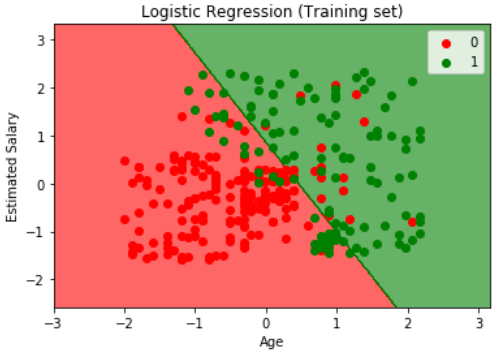
In [23]:
```
print(y_pred[:20])
print(y_test[:20])
```

```
[0 0 0 0 0 0 0 1 0 1 0 0 0 0 0 0 0 0 1 0]
[0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 1 0]
```

In [25]:
```
from sklearn.metrics import confusion_matrix
cm = confusion_matrix(y_test, y_pred)
print(cm)
```

```
[[65  3]
 [ 8 24]]
```

In [26]:
```
# Visualizing the Training set results
from matplotlib.colors import ListedColormap
X_set, y_set = X_train, y_train
X1, X2 = np.meshgrid(np.arange(start = X_set[:, 0].min() - 1, stop = X_set[:, 0].max() + 1, step = 0.01),
                     np.arange(start = X_set[:, 1].min() - 1, stop = X_set[:, 1].max() + 1, step = 0.01))
plt.contourf(X1, X2, classifier.predict(np.array([X1.ravel(), X2.ravel()]).T).reshape(X1.shape),
             alpha = 0.6, cmap = ListedColormap(('red', 'green')))
plt.xlim(X1.min(), X1.max())
plt.ylim(X2.min(), X2.max())
for i, j in enumerate(np.unique(y_set)):
    plt.scatter(X_set[y_set == j, 0], X_set[y_set == j, 1],
                c = ListedColormap(('red', 'green'))(i), label = j)
plt.title('Logistic Regression (Training set)')
plt.xlabel('Age')
plt.ylabel('Estimated Salary')
plt.legend()
plt.show()
```



In [ ]: