Practical No: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

[2]:
```
import pandas as pd
import numpy as np
import seaborn as sns
```

[3]:
```
df=pd.read_csv('Social_Network_Ads.csv')
df
```

[3]:

	User ID	Gender	Age	EstimatedSalary	Purchased
0	15624510	Male	19.0	19000.0	0
1	15810944	Male	35.0	20000.0	0
2	15668575	Female	26.0	43000.0	0
3	15603246	Female	27.0	57000.0	0
4	15804002	Male	19.0	76000.0	0
...	...	...	...	...	...
395	15691863	Female	46.0	41000.0	1
396	15706071	Male	51.0	23000.0	1
397	15654296	Female	50.0	20000.0	1
398	15755018	Male	36.0	33000.0	0
399	15594041	Female	49.0	36000.0	1

[4]:
```
X = df.iloc[:, [2, 3]].values  # Age and Estimated Salary Columns
y = df.iloc[:, 4].values       # Purchased Column
```

[6]:
```
# Splitting Dataset into Training and Testing Sets

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)
```

[8]:
```
# Feature Scaling

from sklearn.preprocessing import StandardScaler
sc = StandardScaler()
X_train = sc.fit_transform(X_train)
X_test = sc.transform(X_test)
```

[9]:
```
# Fitting Logistic Regression Model

from sklearn.linear_model import LogisticRegression
model = LogisticRegression()
model.fit(X_train, y_train)
```

[9]:
```
LogisticRegression()
```

[10]:
```
# Prediction
y_pred = model.predict(X_test)
```

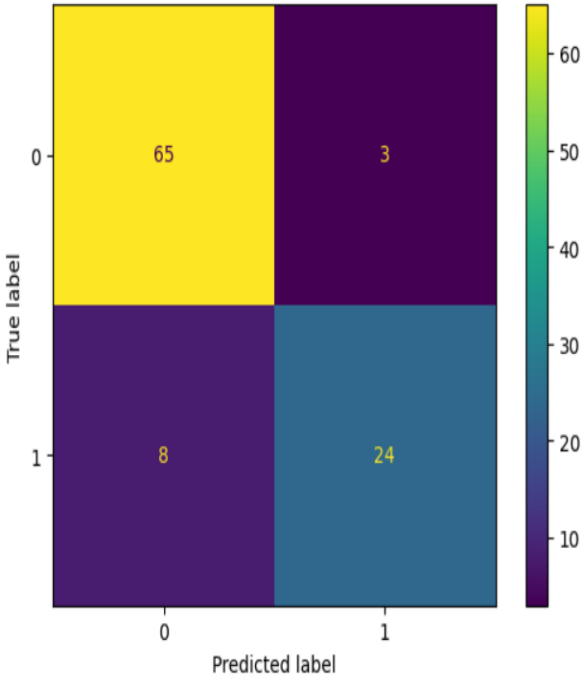
[11]:
```
# Confusion Matrix

from sklearn.metrics import confusion_matrix, accuracy_score, precision_score, recall_score
cm = confusion_matrix(y_test, y_pred)
print("\nConfusion Matrix:\n", cm)
```

```
Confusion Matrix:
 [[65  3]
 [ 8 24]]
```

[12]:
```
from sklearn.metrics import ConfusionMatrixDisplay
ConfusionMatrixDisplay.from_predictions(y_test,y_pred)
```

[12]:
```
<sklearn.metrics._plot.confusion_matrix.ConfusionMatrixDisplay at 0x1f81fbd6d50>
```



[13]:
```
# Calculating TP, TN, FP, FN
TP = cm[1, 1]
TN = cm[0, 0]
FP = cm[0, 1]
FN = cm[1, 0]
```

[14]:
```
# Accuracy
accuracy = accuracy_score(y_test, y_pred)
error_rate = 1 - accuracy
precision = precision_score(y_test, y_pred)
recall = recall_score(y_test, y_pred)
```

[15]:
```
# Results
print("\nTrue Positive (TP):", TP)
print("True Negative (TN):", TN)
print("False Positive (FP):", FP)
print("False Negative (FN):", FN)
print("Accuracy:", accuracy)
print("Error Rate:", error_rate)
print("Precision:", precision)
print("Recall:", recall)
```

```
True Positive (TP): 24
True Negative (TN): 65
False Positive (FP): 3
False Negative (FN): 8
Accuracy: 0.89
Error Rate: 0.10999999999999999
Precision: 0.8888888888888888
Recall: 0.75
```