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Roll_no :- 01 "B"

Batch :- TB1-B2

Pratical 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 datast.

In [1]:
```
import numpy as np
import pandas as pd
```

In [2]:
```
df=pd.read_csv('Social_Network_Ads.csv')
```

In [3]:
```
df.head()
```

Out[3]:

	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

In [4]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 400 entries, 0 to 399
Data columns (total 5 columns):
 #   Column           Non-Null Count  Dtype 
---  ------           --------------  ----- 
 0   User ID          400 non-null    int64 
 1   Gender           400 non-null    object
 2   Age              400 non-null    int64 
 3   EstimatedSalary  400 non-null    int64 
 4   Purchased        400 non-null    int64 
dtypes: int64(4), object(1)
memory usage: 15.8+ KB
```

In [5]:
```
df.describe()
```

Out[5]:

	User ID	Age	EstimatedSalary	Purchased
count	4.000000e+02	400.000000	400.000000	400.000000
mean	1.569154e+07	37.655000	69742.500000	0.365000
std	7.165832e+04	10.482877	34096.960282	0.482033
min	1.556669e+07	18.000000	15000.000000	0.000000
25%	1.562676e+07	29.750000	43000.000000	0.000000
50%	1.569434e+07	37.000000	70000.000000	0.000000
75%	1.575036e+07	46.000000	88000.000000	1.000000
max	1.581524e+07	60.000000	150000.000000	1.000000

In [10]:
```
X=df[['Age','EstimatedSalary']]
Y=df['Purchased']
```

In [12]:
```
from sklearn.preprocessing import StandardScaler
scaler = StandardScaler()
X = scaler.fit_transform(X)
```

In [13]:
```
from sklearn.model_selection import train_test_split
X_train, X_test, Y_train, Y_test = train_test_split(X,Y,test_size=0.20,random_state = 42)
print(f'Train Dataset Size-X:{X_train.shape},Y:{Y_train.shape}')
print(f'Test Dataset Size-X:{X_test.shape},Y:{Y_test.shape}')
```

```
Train Dataset Size-X:(320, 2),Y:(320,)
Test Dataset Size-X:(80, 2),Y:(80,)
```

In [14]:
```
import matplotlib.pyplot as plt
import seaborn as sns
import warnings
warnings.filterwarnings("ignore")
```

In [16]:
```
from sklearn.linear_model import LogisticRegression
lm= LogisticRegression(random_state = 42, n_jobs =-1)
```

```
lm.fit(X_train, Y_train)
predictions = lm.predict(X_test)
```

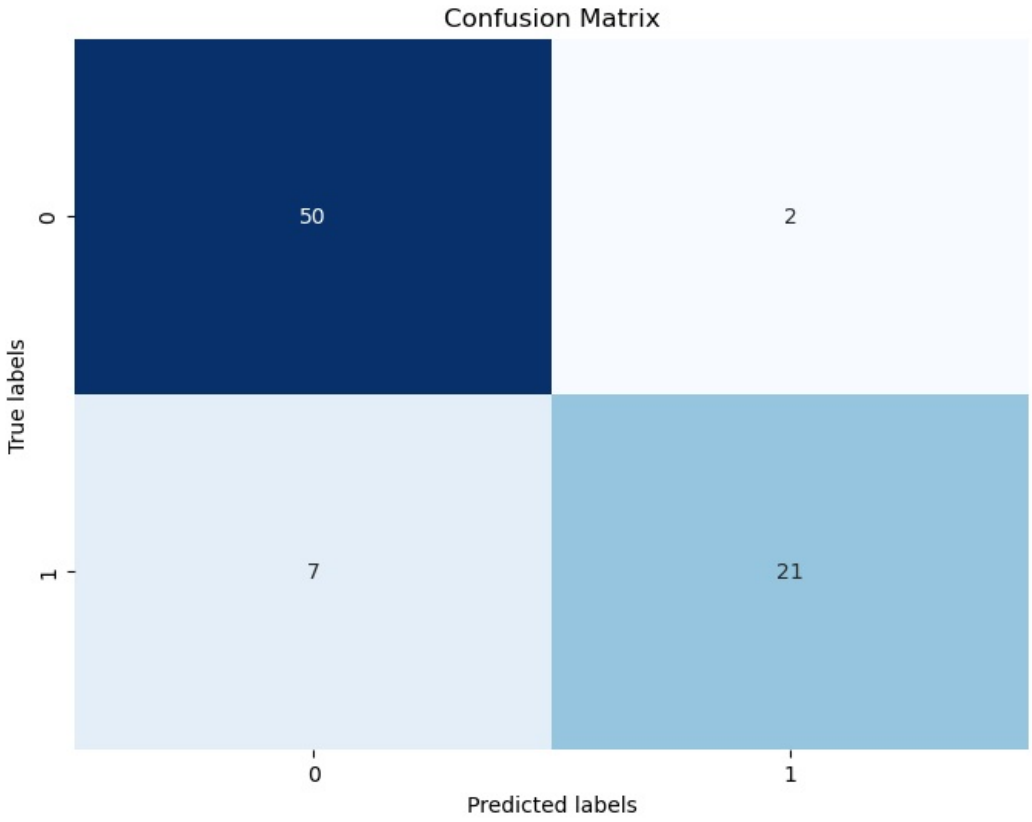
In [17]:
```
from sklearn.metrics import classification_report
cm= classification_report(Y_test,predictions)
print('Classification report : \n',cm)
```

```
Classification report :
               precision    recall  f1-score   support

           0       0.88      0.96      0.92        52
           1       0.91      0.75      0.82        28

    accuracy                           0.89        80
   macro avg       0.90      0.86      0.87        80
weighted avg       0.89      0.89      0.88        80
```

In [18]:
```
from sklearn.metrics import classification_report, confusion_matrix
conf_matrix = confusion_matrix(Y_test,predictions)
plt.figure(figsize=(8, 6))
sns.heatmap(conf_matrix, annot=True, fmt='d', cmap='Blues', cbar=False)
plt.xlabel('Predicted labels')
plt.ylabel('True labels')
plt.title('Confusion Matrix')
plt.show()
```



In [19]:
```
y_pred =lm.predict(X_test)
cm=confusion_matrix(Y_test,y_pred)
TN = cm[0,0]
FP =cm[0,1]
FN =cm[1, 0]
TP = cm[1,1]
accuracy=(TP+TN)/float(TP+TN+FP+FN)
error_rate=(FP+FN)/float(TP+TN+FP+FN)
precision =TP/ float(TP+FP)
recall = TP/float(TP+FN)
print("\nPerformanc Metrics:")
print("True Positives (TP):",TP)
print("False Positives(FP):",FP)
print("True Negatives(TN):", TN)
print("False Negatives (FN):",FN)
print("Accuracy:", accuracy)
print("Error Rate:", error_rate)
print("Precision:", precision)
print("Recall:", recall)
```

```
Performanc Metrics:
True Positives (TP): 21
False Positives(FP): 2
True Negatives(TN): 50
False Negatives (FN): 7
Accuracy: 0.8875
Error Rate: 0.1125
Precision: 0.9130434782608695
Recall: 0.75
```

In [ ]:

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