Assignment No-05

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Roll No-17

Title-Implement logistic regression using Python/R to perform classification on Social_Network_Ads.csv dataset.

In [1]:
```
import pandas as pd # Data handling
import numpy as np # Numerical operations
import matplotlib.pyplot as plt # Data visualization
from sklearn.model_selection import train_test_split # Train-test split
from sklearn.preprocessing import StandardScaler # Feature scaling
from sklearn.linear_model import LogisticRegression
from sklearn.metrics import accuracy_score, confusion_matrix,precision_score
from sklearn.preprocessing import LabelEncoder
```

In [3]:
```
df=pd.read_csv("Downloads/Social_Network_Ads.csv")
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 [5]:
```
label_encoder = LabelEncoder()
df["Gender"] = label_encoder.fit_transform(df["Gender"])
df.head()
```

Out[5]:

	User ID	Gender	Age	EstimatedSalary	Purchased
0	15624510	1	19	19000	0
1	15810944	1	35	20000	0
2	15668575	0	26	43000	0
3	15603246	0	27	57000	0
4	15804002	1	19	76000	0

In [7]:
```
df.isnull().sum()
```

Out[7]:
```
User ID            0
Gender             0
Age                0
EstimatedSalary    0
Purchased          0
dtype: int64
```

In [9]:
```
df.cov()
```

Out[9]:

	User ID	Gender	Age	EstimatedSalary
User ID	5.134915e+09	-905.617719	-541.682870	1.737143e+08
Gender	-9.056177e+02	0.250526	-0.386917	-1.031404e+03
Age	-5.416829e+02	-0.386917	109.890702	5.548738e+04
EstimatedSalary	1.737143e+08	-1031.403509	55487.380952	1.162603e+09
Purchased	2.448363e+02	-0.010201	3.131165	5.924367e+03

In [11]:
```
X = df.drop(columns=["Purchased"]) # Assuming "Purchased" is the targetvaria
Y = df["Purchased"]
xtrain, xtest, ytrain, ytest = train_test_split(X, Y, test_size=0.2,
random_state=42)
from sklearn import preprocessing
scaler = preprocessing.MinMaxScaler()
features_scaled = scaler.fit_transform(df)
df_normalized = pd.DataFrame(features_scaled, columns = df.columns)
df_normalized
```

Out[11]:

	User ID	Gender	Age	EstimatedSalary	Purchased
0	0.232636	1.0	0.023810	0.029630	0.0
1	0.982732	1.0	0.404762	0.037037	0.0
2	0.409926	0.0	0.190476	0.207407	0.0
3	0.147083	0.0	0.214286	0.311111	0.0
4	0.954801	1.0	0.023810	0.451852	0.0
...	...	...	...	...	...
395	0.503623	0.0	0.666667	0.192593	1.0
396	0.560787	1.0	0.785714	0.059259	1.0
397	0.352477	0.0	0.761905	0.037037	1.0
398	0.757720	1.0	0.428571	0.133333	0.0
399	0.110048	0.0	0.738095	0.155556	1.0

400 rows × 5 columns

In [13]:
```
logreg = LogisticRegression()
logreg.fit(xtrain, ytrain)
```

Out[13]:

```
LogisticRegression()
```

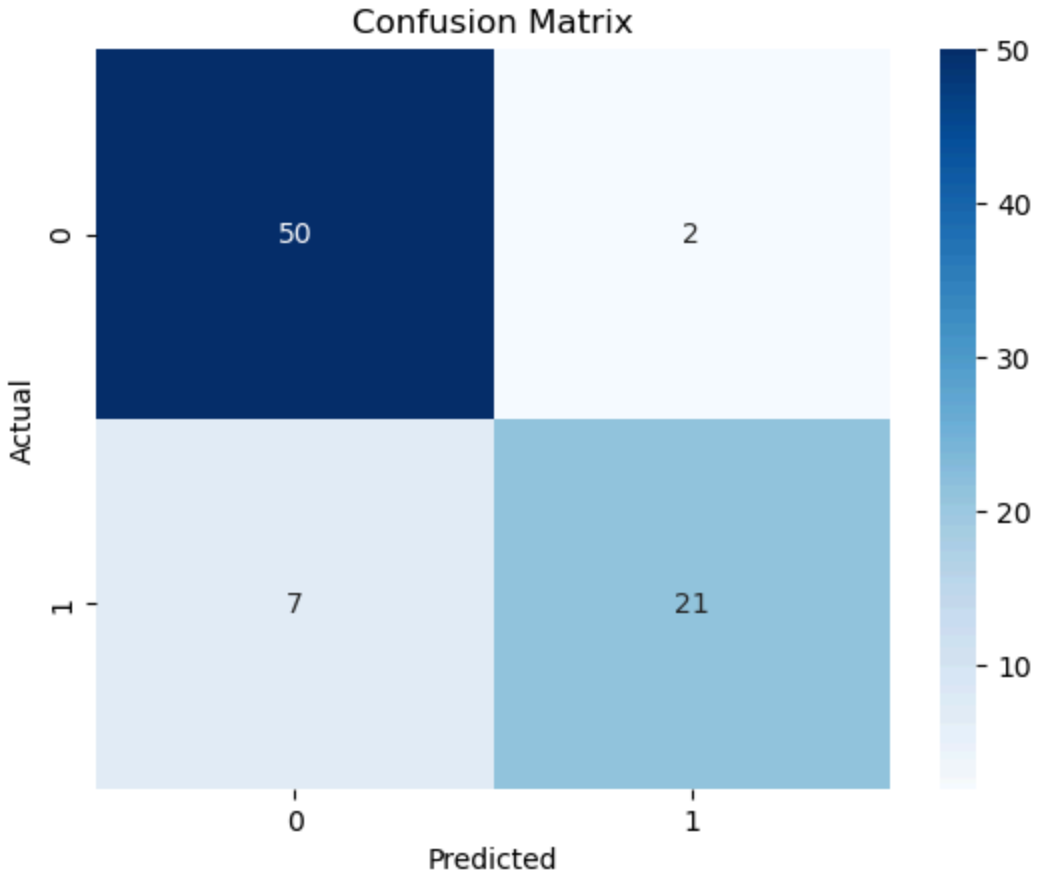
In [15]:

```
y_pred_train = logreg.predict(xtrain)
y_pred_test = logreg.predict(xtest)
train_acc = accuracy_score(ytrain, y_pred_train)
test_acc = accuracy_score(ytest, y_pred_test)
cm = confusion_matrix(ytest, y_pred_test)
precision = precision_score(ytest, y_pred_test)
recall = recall_score(ytest, y_pred_test)
print("Training Accuracy:", train_acc)
print("Testing Accuracy:", test_acc)
print("Confusion Matrix:\n", cm)
print("Precision:", precision)
print("Recall:", recall)
```

```
Training Accuracy: 0.840625
Testing Accuracy: 0.8875
Confusion Matrix:
 [[50  2]
 [ 7 21]]
Precision: 0.9130434782608695
Recall: 0.75
```

In [17]:

```
import seaborn as sns
sns.heatmap(cm, annot=True, fmt="d", cmap="Blues")
plt.xlabel("Predicted")
plt.ylabel("Actual")
plt.title("Confusion Matrix")
plt.show()
```



In [ ]: