```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LogisticRegression
from sklearn.preprocessing import StandardScaler
from sklearn.metrics import *
from sklearn.tree import DecisionTreeClassifier
```

```
df = pd.read_csv("https://raw.githubusercontent.com/shivang98/Social-Network-ads-Boost/master/Social_Network_Ads.csv")
df
```

	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
...	...	...	...	...	...
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 × 5 columns

```
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
```

```
df.describe()
```

	User ID	Age	EstimatedSalary	Purchased
count	4.000000e+02	400.000000	400.000000	400.000000
mean	1.569154e+07	37.655000	69742.500000	0.357500
std	7.165832e+04	10.482877	34096.960282	0.479864
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

```
df.isnull().sum()
```

```
User ID            0
Gender             0
Age                0
EstimatedSalary    0
```

```
Purchased          0
dtype: int64
```

```
df.shape
```

```
(400, 5)
```

```
x = df.iloc[:, 2:4]
```

```
y = df.iloc[:, 4]
```

```
x_train, x_test, y_train, y_test = train_test_split(x, y, test_size=0.3, random_state=42)
```

```
scale = StandardScaler()
x_train = scale.fit_transform(x_train)
x_test = scale.transform(x_test)
```

```
clf = LogisticRegression(random_state=0)
```

```
clf.fit(x_train, y_train)
```

```
▾ LogisticRegression
LogisticRegression(random_state=0)
```

```
pred = clf.predict(x_test)
```

```
pred
```

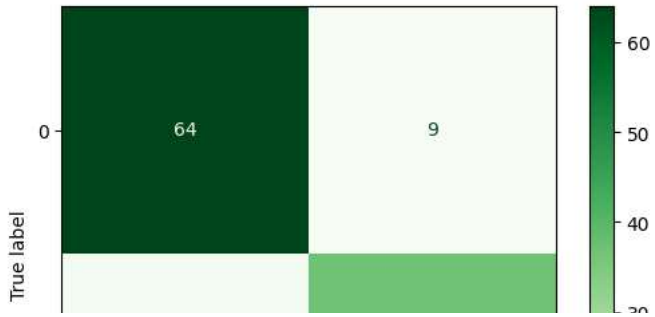
```
array([0, 1, 0, 1, 0, 0, 1, 0, 0, 0, 0, 1, 0, 0, 0, 0, 1, 1, 0, 1, 0, 0,
       0, 1, 0, 0, 1, 0, 1, 0, 0, 0, 1, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0,
       0, 1, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 1, 0, 0, 0,
       1, 1, 0, 0, 1, 0, 0, 0, 0, 0, 1, 1, 0, 0, 0, 0, 1, 0, 1, 0, 0, 1,
    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

```
print(classification_report(y_test, pred))
```

```
                  precision    recall  f1-score   support

               0       0.82      0.97      0.89        73
               1       0.94      0.66      0.78        47

        accuracy                           0.85       120
       macro avg       0.88      0.82      0.83       120
    weighted avg       0.86      0.85      0.84       120
```

```
cm= confusion_matrix(y_test, pred)
```

```
dtc = DecisionTreeClassifier(random_state=0)
dtc.fit(x_train, y_train)
pred = dtc.predict(x_test)

cm= confusion_matrix(y_test, pred)

conf_matrix = ConfusionMatrixDisplay(confusion_matrix=cm,display_labels=dtc.classes_)
conf_matrix.plot(cmap=plt.cm.Greens)
plt.show()
```




```
tp, fn, fp, tn = confusion_matrix(y_test, pred, labels = [1,0]).reshape(-1)
```

```
print("Accuracy: ", accuracy_score(y_test, pred))
print("Error Rate: ", (fp+fn)/(tp+tn+fp+fn))
print("Recall: ", tp/(tp+fn))
print("Specifity: ", tn/(fp+tn))
print("Prediction: ", tp/(tp+fp))
print("False Positive Rate: ", fp/(tn+fp))
```

```
Accuracy:  0.8416666666666667
Error Rate:  0.15833333333333333
Recall:  0.7872340425531915
Specifity:  0.8767123287671232
Prediction:  0.8043478260869565
False Positive Rate:  0.1232876712328767
```

```
pred_prob = clf.predict_proba(x_test)[:, 1]

# Plot a scatter plot of the input feature(s) versus the predicted probabilities
plt.scatter(x_test[:, 0], pred_prob)
plt.xlabel('Input Feature 1')
plt.ylabel('Predicted Class Probability')
plt.title('Logistic Regression Predictions')
plt.show()
```