EX NO :3
DATE:

A PYTHON PROGRAM TO IMPLEMENT THE LOGISTIC MODEL

AIM:

To implement a Python program for the logistic model using the.

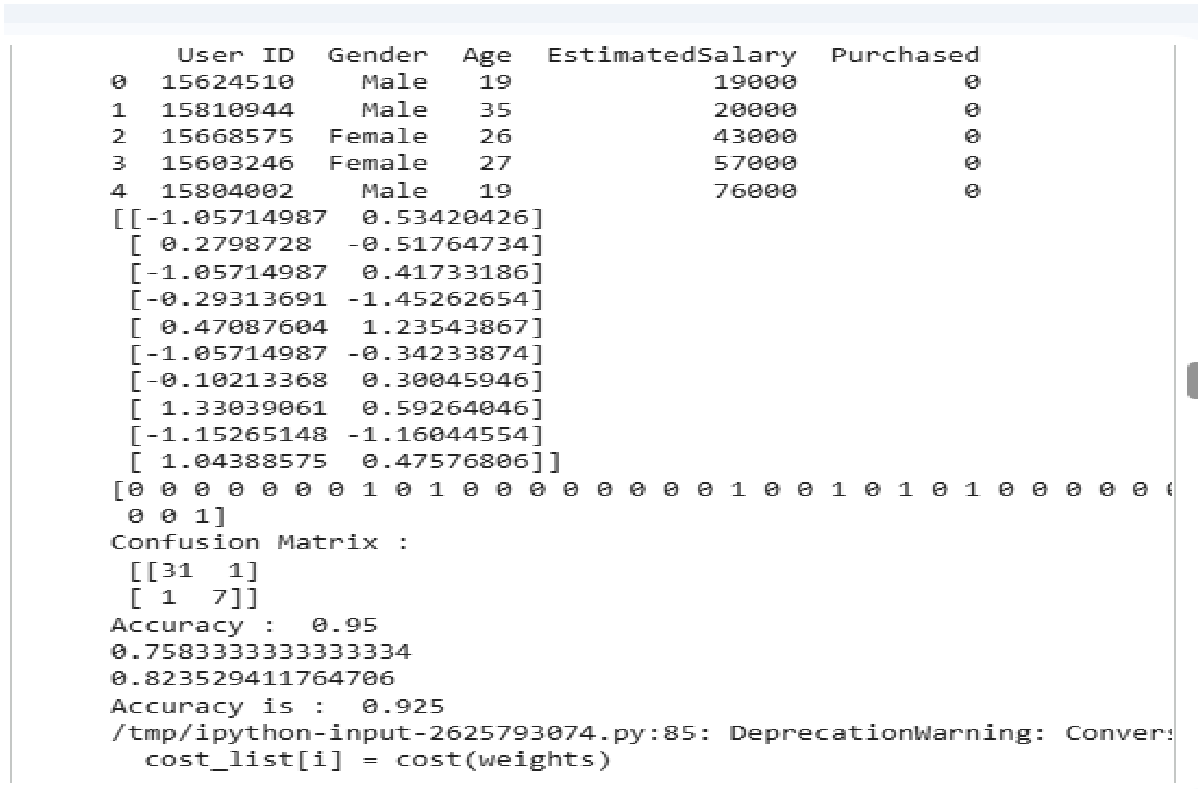
PROGRAM:

```
import pandas as pd
import numpy as np
from numpy import log,dot,exp,shape
from sklearn.metrics import confusion_matrix
data = pd.read_csv('/content/suv_data.csv')
print(data.head())

x = data.iloc[:, [2, 3]].values
y = data.iloc[:, 4].values
from sklearn.model_selection import train_test_split
x_train, x_test, y_train, y_test=train_test_split(x,y,test_size=0.10, random_state=0)
from sklearn.preprocessing import StandardScaler
sc=StandardScaler()
x_train=sc.fit_transform(x_train)
x_test=sc.transform(x_test)
print (x_train[0:10,:])

from sklearn.linear_model import LogisticRegression
classifier=LogisticRegression(random_state=0)
classifier.fit(x_train,y_train)
LogisticRegression (random_state=0)
y_pred = classifier.predict(x_test)
print(y_pred)

from sklearn.metrics import confusion_matrix
cm = confusion_matrix(y_test, y_pred)
print ("Confusion Matrix : \n", cm)

from sklearn.metrics import accuracy_score
print ("Accuracy : ", accuracy_score(y_test, y_pred))


# User Defined function
from sklearn.model_selection import train_test_split
x_train, x_test, y_train, y_test=train_test_split(x,y,test_size=0.10, random_state=0)

def Std(input_data):
   mean0 = np.mean(input_data[:, 0])
   sd0 = np.std(input_data[:, 0])
   mean1 = np.mean(input_data[:, 1])
   sd1 = np.std(input_data[:, 1])
   return lambda x: ((x[0]-mean0)/sd0, (x[1]-mean1)/sd1)

my_std = Std(x)
my_std(x_train[0])
```

```
def standardize(X_tr):
    for i in range(shape(X_tr)[1]):
        X_tr[:,i] = (X_tr[:,i] - np.mean(X_tr[:,i]))/np.std(X_tr[:,i])
def F1_score(y,y_hat):
    tp,tn,fp,fn = 0,0,0,0
    for i in range(len(y)):
        if y[i] == 1 and y_hat[i] == 1:
            tp += 1
        elif y[i] == 1 and y_hat[i] == 0:
            fn += 1
        elif y[i] == 0 and y_hat[i] == 1:
            fp += 1
        elif y[i] == 0 and y_hat[i] == 0:
            tn += 1
    precision = tp/(tp+fp)
    recall = tp/(tp+fn)
    f1_score = 2*precision*recall/(precision+recall)
    return f1_score
class LogisticRegression:
    def sigmoid(self,z):
        sig = 1/(1+exp(-z))
        return sig
    def initialize(self,X):
        weights = np.zeros((shape(X)[1]+1,1))
        X = np.c_[np.ones((shape(X)[0],1)),X]
        return weights,X
    def fit(self,X,y,alpha=0.001,iter=400):
        weights,X = self.initialize(X)

        def cost(theta):
            z = dot(X,theta)
            cost0 = y.T.dot(log(self.sigmoid(z)))
            cost1 = (1-y).T.dot(log(1-self.sigmoid(z)))
            cost = -((cost1 + cost0))/len(y)
            return cost
        cost_list = np.zeros(iter,)
        for i in range(iter):
            weights = weights - alpha*dot(X.T,self.sigmoid(dot(X,weights))-
np.reshape(y,(len(y),1)))
            cost_list[i] = cost(weights)
        self.weights = weights
        return cost_list
    def predict(self,X):
        z = dot(self.initialize(X)[1],self.weights)
        lis = []
        for i in self.sigmoid(z):
            if i>0.5:
                lis.append(1)
            else:
                lis.append(0)
        return lis
standardize(x_train)
standardize(x_test)
obj1 = LogisticRegression()
model= obj1.fit(x_train,y_train)
y_pred = obj1.predict(x_test)
```

```
y_trainn = obj1.predict(x_train)
f1_score_tr = F1_score(y_train,y_trainn)
f1_score_te = F1_score(y_test,y_pred)
print(f1_score_tr)
print(f1_score_te)
conf_mat = confusion_matrix(y_test, y_pred)
accuracy = (conf_mat[0, 0] + conf_mat[1, 1]) / sum(sum(conf_mat))
print("Accuracy is : ",accuracy)
```

OUTPUT:



```
    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
[[-1.05714987  0.53420426]
 [ 0.2798728  -0.51764734]
 [-1.05714987  0.41733186]
 [-0.29313691 -1.45262654]
 [ 0.47087604  1.23543867]
 [-1.05714987 -0.34233874]
 [-0.10213368  0.30045946]
 [ 1.33039061  0.59264046]
 [-1.15265148 -1.16044554]
 [ 1.04388575  0.47576806]]
[0 0 0 0 0 0 0 1 0 1 0 0 0 0 0 0 0 0 1 0 0 1 0 1 0 1 0 0 0 0 0
 0 0 1]
Confusion Matrix :
 [[31  1]
 [ 1  7]]
Accuracy :  0.95
0.7583333333333334
0.823529411764706
Accuracy is :  0.925
/tmp/ipython-input-2625793074.py:85: DeprecationWarning: Conver
  cost_list[i] = cost(weights)
```

RESULT:

Thus, the Python program to implement logistic regression for the given dataset is analyzed, and the logistic regression model is classified successfully. The performance of the developed model is measured using the F1-score and Accuracy