A PYTHON PROGRAM TO IMPLEMENT LOGISTIC MODEL

Expt no. 3

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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("C:\\Users\\Luqman\\Downloads\\archive (4)\\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 as SkLogReg
```

```
classifier = SkLogReg(random_state=0)
classifier.fit(x_train, y_train)
SkLogReg(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)
```

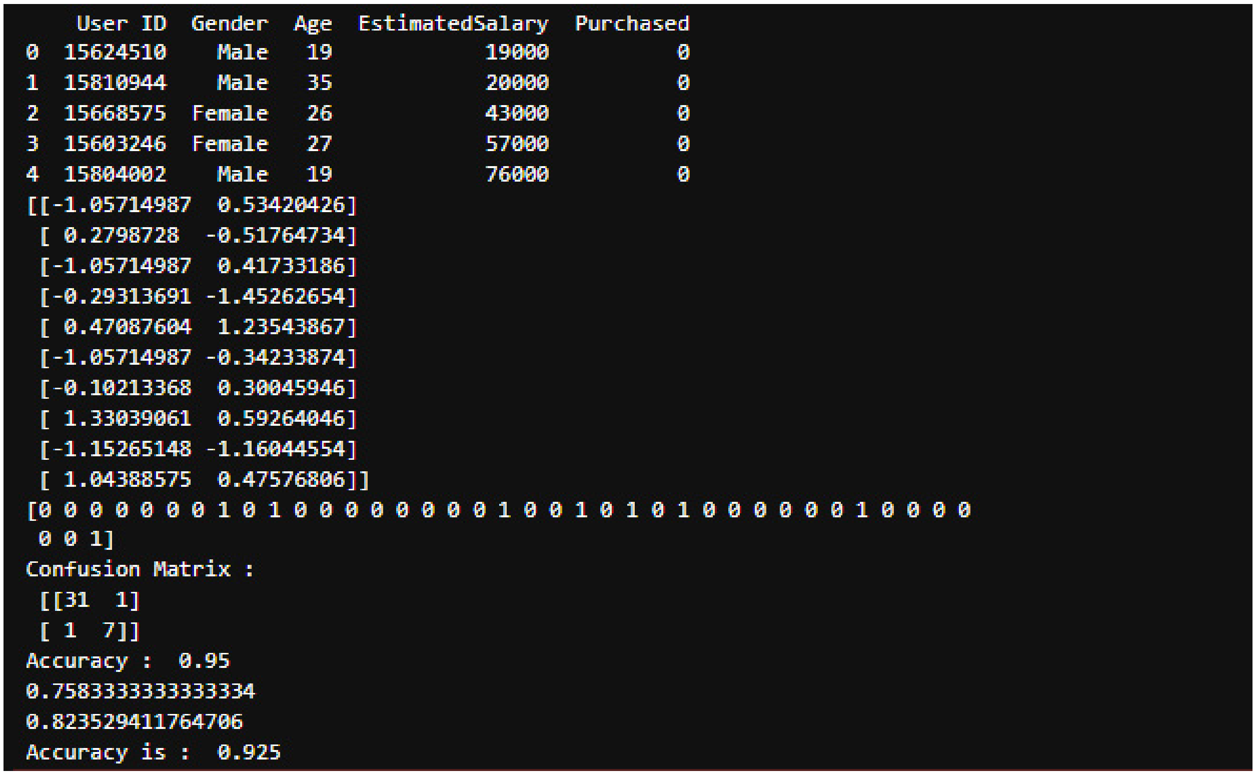
```
from sklearn.metrics import accuracy_score
print("Accuracy : ", accuracy_score(y_test, y_pred))
```

```
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] # add bias column return
        weights, X
```

```
def fit(self, X, y, alpha=0.001, iter=400):
    weights, X = self.initialize(X)
    y = y.reshape(-1,1)

    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))-y)
        cost_list[i] = cost(weights)

    self.weights = weights
    return cost_list

def predict(self, X):
    X = np.c_[np.ones((shape(X)[0],1)), X] # add bias column
    z = dot(X, 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 1 0 0 0 0
 0 0 1]
Confusion Matrix :
 [[31  1]
 [ 1  7]]
Accuracy :  0.95
0.7583333333333334
0.823529411764706
Accuracy is :  0.925
```