EXPT NO : 2 **A python program to implement Simple linear**

DATE: **Regression using Least Square Method**

AIM:

To write a python program to implement Simple linear regression using Least Square Method.

PROCEDURE:

Implementing Simple linear regression using Least Square method using the headbrain dataset involve the following steps:

Step 1: Import Necessary Libraries

First, import the libraries that are essential for data manipulation, visualization, and model building.

```
import pandas as pd

import matplotlib.pyplot as plt

import numpy as np
```

Step 2: Load the Iris Dataset

The HeadBrain dataset can be loaded. `data =`

```
pd.read_csv('/content/headbrain.csv')
```

Step 3: Data Preprocessing

Ensure the data is clean and ready for modeling. Since the Iris dataset is clean, minimal preprocessing is needed.

```
x,y=np.array(list(data['Head Size(cm^3)'])),np.array(list(data['Brain
Weight(grams)']))


print(x[:5],y[:5])
```

OUTPUT :

```
[4512 3738 4261 3777 4177] [1530 1297 1335 1282 1590]
```

Step 4 :Compute the Least Squares Solution

Apply the least squares formula to find the regression coefficients.

```
def get_line(x,y):

 x_m,y_m = np.mean(x), np.mean(y)

 print(x_m,y_m)

 x_d,y_d=x-x_m,y-y_m

 m = np.sum(x_d*y_d)/np.sum(x_d**2)

 c = y_m - (m*x_m)

 print(m, c)

 return lambda x : m*x+c

lin=get_line(x,y)
```

OUTPUT :

```
3633.9915611814345 1282.873417721519
0.2634293394893993 325.5734210494428
```

Step 5 : Make Predictions

Use the model to make predictions based on the independent variable.

```
def get_error(line_fuc, x, y):
```

```
 y_m = np.mean(y)

 y_pred = np.array([line_fuc(_) for _ in x])

 ss_t = np.sum((y-y_m)**2)
 ss_r = np.sum((y-y_pred)**2)

 return 1-(ss_r/ss_t)

get_error(lin, x, y)

from sklearn.linear_model import LinearRegression

x = x.reshape((len(x),1))

reg=LinearRegression()

reg=reg.fit(x, y)

print(reg.score(x, y))
```

OUTPUT :

```
1.0
```

```
1.0
```

Step 6 :Visualize the Results

Plot the original data points and the fitted regression line.

```
x=np.linspace(np.min(x)-100,np.max(x)+100,1000)

y=np.array([lin(x)for x in x])

plt.plot(x, y, color='red', label='Regression line')

plt.scatter(x, y, color='green', label='Scatter plot')
```

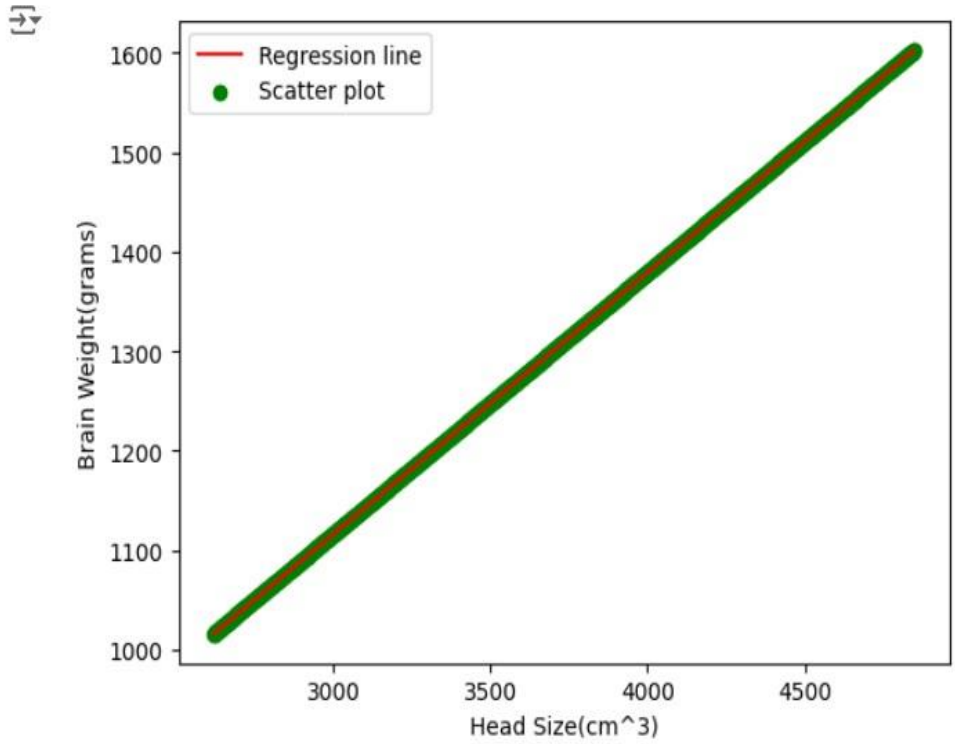
```
plt.xlabel('Head Size(cm^3)')

plt.ylabel('Brain Weight(grams)')

plt.legend()

plt.show()
```

OUTPUT :



RESULT:

This step-by-step process will help us to implement least square regression models using the HeadBrain dataset and analyze their performance.