

Exp.no:2

A Python program to implement Simple linear regression using least square method

Aim:-

To implement a python program for constructing a Simple linear regression using least Square method.

Algorithm:-

Step 1: Import necessary libraries:

- \* Pandas for data manipulation and matplotlib.pyplot for plotting.

Step 2: Read the dataset:

- \* Use the pandas 'read\_csv' function to read the dataset (Eg: head brain.csv).
- \* Store dataset in a variable (Eg. 'dataset')

Step 3: Prepare the data:

- \* Extract the independent variable ( $X$ ) and dependent variable ( $Y$ ) from dataset.
- \* Reshape  $X$  and  $Y$  to be 2D array if needed.

Step 4: Calculate the mean:

- \* Calculate the mean of  $X$  and  $Y$ .

Step 5: Calculate the coefficients:

- \* Calculate the slope ( $m$ ) using the formula.

$$m = \frac{\sum_{i=1}^n (x_i - \bar{x})(y_i - \bar{y})}{\sum_{i=1}^n (x_i - \bar{x})^2}$$

- \* Calculate the intercept ( $b$ ) using the formula:  $b = \bar{y} - m\bar{x}$ .

Step 6: Make predictions:

- \* use the calculated slope and intercept to make predictions for each  $x$  value:

$$\hat{y} = mx + b$$

Step 7: Plot regression lines:

- \* plot the original data points ( $x, y$ ) as scatter plot.

- \* plot the regression line ( $x, predicted$ ) as a line plot.

Step 9: Display the result:

\* Print the slope intercept and

R-Squared value.

Step 10:- Complete the program:

\* Combine all the steps into a <sup>python</sup> program.

\* Run the program to perform

Simple linear regression on the dataset.

Program:-

import pandas as pd

import matplotlib.pyplot as plt

import numpy as np

data = pd.read\_csv('headbrain.csv')

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

np.array([list(data['Brain weight(grams)'])]))

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

[4512 3788 4251 3777 4177] [1530 1297

1335 1282 1590]

def get\_line(x, y):

$x\_m, y\_m = np.\text{mean}(x), np.\text{mean}(y)$

print(x\_m, y\_m)

$x\_d, y\_d = x - x\_m, y - y\_m$

$m = np.\text{sum}(x\_d * y\_d) / np.\text{sum}(x\_d^2)$

$c = y\_m - (m * x\_m)$

print("Slope(m):", m, "Intercept(c):", c)

return lambda x: m \* x + c

# Get regression function

lin = get\_line(x, y)

# Plotting

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

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

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

plt.scatter(x, y, color='green', label='Data points')

plt.xlabel('Head size (cm^3)')

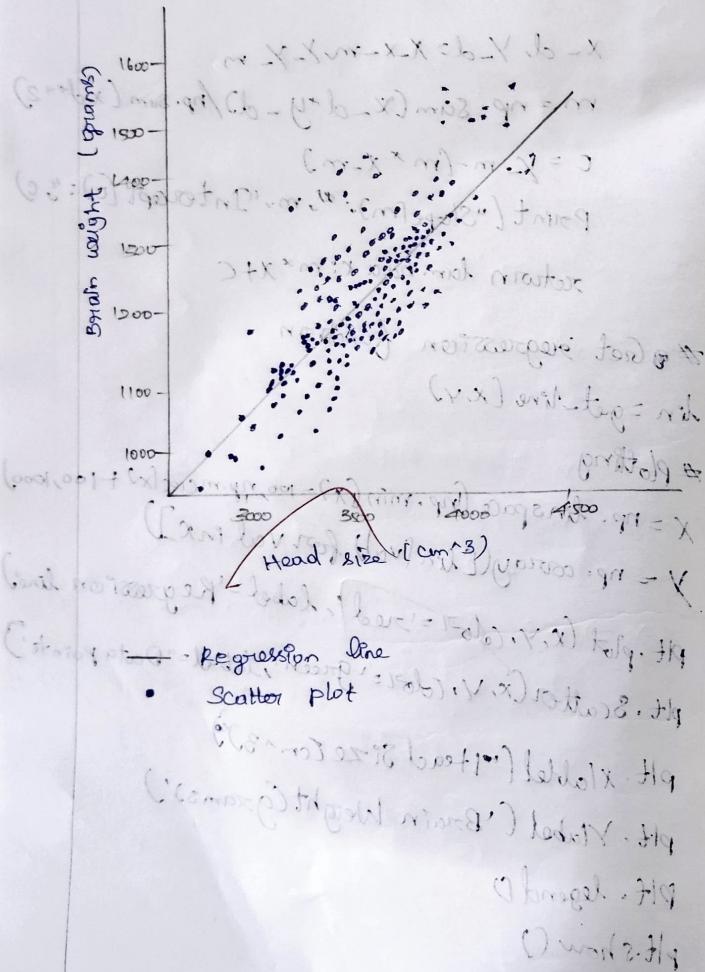
plt.ylabel('Brain weight (grams)')

plt.legend()

plt.show()

✓ Standard job

(x)  $\max_{\theta} \log p(x|\theta)$ , (y)  $\max_{\theta} \log p(x|\theta)$



~~Function to Compute R12 Score manually~~

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

$$- Y_{\bar{m}} = np \cdot \text{mean}(x)$$

$$Y_{\text{Pred}} = np \cdot \text{cooccy}(\text{Eline} - \text{funcl}(-) \text{ for } -m^X)$$

$$SS_{-t} = np \cdot \text{sum}((y - \bar{y})^2)$$

$$SS_{\text{PI}} = np \cdot \text{sum}[(Y - Y_{\text{pred}})^2]$$

$$\pi^2 - \pi = (ss - \pi)(ss + \pi)$$

Notes n 12

2) Point R^2 from manual method  
Print("manual") R^2 score: ", get\_error(lin, x, y))

# Linear Regression

~~Using sklearn linear regression~~  
from sklearn.linear\_model import LinearRegression

$x\_reshaped = x.reshape((len(x), 1))$  reshape to  
2D for sklearn.

`greg = LinearRegression()`

reg. fit(x - reshaped x)

point ("skewness R^2 Score": neg. Score ( $x_{\text{restaged}}$ )  
 $y$ ))

Algorithms are the steps or sequence of instructions

(x, y) input -> output files

(a) memory -> X

(b) memory -> (x, y) process -> output X

(S + A + B + C) memory -> T, Z

(S + A + B + C) memory -> M, N, O, P

(T, Z, M, N) -> P, Q

See memory

Another learning model S + A + T, Z  
(X, Y) form to be derived S + A + (M, N, O, P)  
T, Z, M, N, O, P

nonparametric model, non-linear regression

nonparametric regression analysis, non-linear regression model

structures (G, G, A, B) & other X -> Y -> Z

(nonparametric regression)

(nonparametric regression)

(nonparametric regression)

A python program to implement linear regression

To implement python program for the  
regression using sin - cos dataset

Algorithm

Step 1: Import necessary libraries.

is pandas for data manipulation

+ Sklearn model selection for linear least square

+ sklearn preprocessing for data preparation

+ matplotlib.pyplot for plotting

Step 2: Read the Dataset

is the path to read the csv - file

selected path in the browser

then update the value

and select the relevant column for the output

and select the relevant column for the output

Result:

Thus, The python program to implement  
Simple linear regression using least Square  
~~method~~ method for the given head brain dataset  
is analyzed and linear regression line is  
constructed successfully.