Application 9

Supervised Machine Learning
Linear Regression with User Defined Algorithm

Consider below application which implements linear regression using Least Square method.
We are using R Square method to find out Goodness of fit.

```python
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt

def MarvellousPredictor():

    # Load data
    X = [1,2,3,4,5]
    Y = [3,4,2,4,5]

    print("Values of Independent of variables x",X)
    print("Values of Dependent of variables y",Y)

    # Least Square method
    mean_x = np.mean(X)
    mean_y = np.mean(Y)

    print("Mean of Independent variable x",mean_x)
    print("Mean of Dependent variable y",mean_y)
    n = len(X)

    numerator = 0
    denomenator = 0

    # Equation of line is y = mx + c

    for i in range(n):
        numerator += (X[i] -mean_x)*(Y[i] - mean_y)

        denomenator += (X[i] - mean_x)**2

    m = numerator / denomenator

    # c = y' - mx'

    c = mean_y - (m * mean_x)

    print("Slope of Regression line is",m)          # 0.4
    print("Y intercept of Regression line is",c)    # 2.4

    # Display plotting of above points
    x = np.linspace(1,6,n)

    y = c + m * x

    plt.plot(x,y, color='#58b970', label='Regression Line')

    plt.scatter(X,Y, color='#ef5423' ,label='scatter plot')

    plt.xlabel('X - Independent Variable')
    plt.ylabel('Y - Dependent Variable')

    plt.legend()
    plt.show()
```

```
56    # Findout goodness of fit ie R Square
57    ss_t = 0
58    ss_r = 0
59
60    for i in range(n):
61        y_pred = c + m *X[i]
62        ss_t += (Y[i] - mean_y) ** 2
63        ss_r += (Y[i] - y_pred) ** 2
64
65    r2 = 1 - (ss_r/ss_t)
66
67    print("Goodness of fit using R2 methos is",r2)
68
69 def main():
70    print("---- Marvellous Infosystems by Piyush Khairnar-----")
71
72    print("Suervised Machine Learning")
73
74    print("Linear Regreesion")
75
76    MarvellousPredictor()
77
78 if __name__ == "__main__":
79    main()
80
```

Output of above application

```
(base) MacBook-Pro-de-MARVELLOUS:Machine_Learning m
arvellous$ python3 LinearRegression.py
---- Marvellous Infosystems by Piyush Khairnar-----
Suervised Machine Learning
Linear Regreesion
Values of Independent of variables x [1, 2, 3, 4, 5
]
Values of Dependent of variables y [3, 4, 2, 4, 5]
Mean of Independent variable x 3.0
Mean of Dependent variable y 3.6
Slope of Regression line is 0.4
Y intercept of Regression line is 2.4
Goodness of fit using R2 methos is 0.30769230769230
78
(base) MacBook-Pro-de-MARVELLOUS:Machine_Learning m
arvellous$ ▉
```

Graph plotted for the input data set