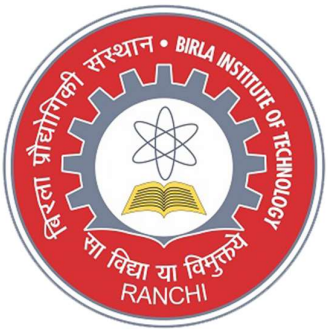
Birla Institute of Technology,Mesra,
Patna Campus



ML-LAB

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Roll-Btech/15044/18

Sec-CSE 6th

#Assignment-10

Problem: Implement the non-parametric locally weighted Regression algorithm in order to fit data points. Select appropriate dataset for your experiment and draw graphs.

Code:-

```
#Fitting to Give n Ploynomial Of degree 1 (Linear Regression)
from math import ceil
import numpy as np
from scipy import linalg



def lowess(x, y, f= 2. / 3., iter=3):


   n = len(x) # Number of x  points
   r = int(ceil(f * n))  # Computing the residual of smoothing functions
   h = [np.sort(np.abs(x - x[i]))[r] for i in range(n)] #
   w = np.clip(np.abs((x[:, None] - x[None, :]) / h), 0.0, 1.0)  # Weight Function
   w = (1 - w ** 3) ** 3  # Tricube Weight Function
   ypred = np.zeros(n) # Initialisation of predictor
   delta = np.ones(n)  # Initialisation of delta
```

```
    for iteration in range(iter):
        for i in range(n):
            weights = delta * w[:, i] # Cumulative Weights
            b = np.array([np.sum(weights * y), np.sum(weights * y * x)]) # Matrix B
            A = np.array([[np.sum(weights), np.sum(weights * x)],
                          [np.sum(weights * x), np.sum(weights * x * x)]]) # Matrix A

            beta = linalg.solve(A, b) # Beta,Solution of AX= B equation
            ypred[i] = beta[0] + beta[1] * x[i]

        residuals = y - ypred   # Finding Residuals
        s = np.median(np.abs(residuals))  # Median of Residuals
        delta = np.clip(residuals / (6.0 * s), -1, 1)  # Delta
        delta = (1 - delta ** 2) ** 2   # Delta

    return ypred

if __name__ == '__main__':  # Main Function

    import math

    n = 100  # Number of data points

    #Case1: Sinusoidal Fitting
    x = np.linspace(0, 2 * math.pi, n)
    print(x)
```

```
y = np.sin(x) + 0.3 * np.random.randn(n)


#Case2 : Straight Line Fitting
#x=np.linspace(0,2.5,n) # For Linear
#y= 1 + 0.25*np.random.randn(n) # For Linear


f = 0.25
ypred = lowess(x, y, f=f, iter=3)


import pylab as pl
pl.clf()
pl.plot(x, y, label='Y NOISY')
pl.plot(x, ypred, label='Y PREDICTED')
pl.legend()
pl.show()
```

Output:-

```
(mlenv) PS C:\Users\vampirepapi\Desktop\nowhere\6th-LABS\ML> python lab10.py
[0.         0.06346652 0.12693304 0.19039955 0.25386607 0.31733259
 0.38079911 0.44426563 0.50773215 0.57119866 0.63466518 0.6981317
 0.76159822 0.82506474 0.88853126 0.95199777 1.01546429 1.07893081
 1.14239733 1.20586385 1.26933037 1.33279688 1.3962634  1.45972992
 1.52319644 1.58666296 1.65012947 1.71359599 1.77706251 1.84052903
 1.90399555 1.96746207 2.03092858 2.0943951  2.15786162 2.22132814
 2.28479466 2.34826118 2.41172769 2.47519421 2.53866073 2.60212725
 2.66559377 2.72906028 2.7925268  2.85599332 2.91945984 2.98292636
 3.04639288 3.10985939 3.17332591 3.23679243 3.30025895 3.36372547
 3.42719199 3.4906585  3.55412502 3.61759154 3.68105806 3.74452458
 3.8079911  3.87145761 3.93492413 3.99839065 4.06185717 4.12532369
 4.1887902  4.25225672 4.31572324 4.37918976 4.44265628 4.5061228
 4.56958931 4.63305583 4.69652235 4.75998887 4.82345539 4.88692191
 4.95038842 5.01385494 5.07732146 5.14078798 5.2042545  5.26772102
 5.33118753 5.39465405 5.45812057 5.52158709 5.58505361 5.64852012
 5.71198664 5.77545316 5.83891968 5.9023862  5.96585272 6.02931923
 6.09278575 6.15625227 6.21971879 6.28318531]
```