Locally Weighted Regression algorithm | ML LAB 10

What is Regression?

Regression analysis is a statistical method that helps us to analyse and understand the relationship between two or more variables of interest. The process that is adapted to perform regression analysis helps to understand which factors are important, which factors can be ignored and how they are influencing each other.

Regression is used for continuous values

- Dependent Variable: This is the variable that we are trying to understand or forecast.

- Independent Variable: These are factors that influence the analysis or target variable and provide us with information regarding the relationship of the variables with the target variable.

What is Locally weighted Linear Regression?

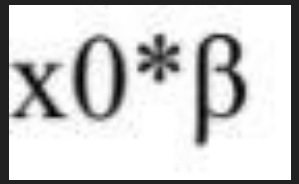
- Locally weighted linear regression is a non-parametric algorithm
- The model does not learn a fixed set of parameters as is done in ordinary linear regression.

- Rather parameters theta are computed individually for each query point x.

Equations in Locally weighted Linear Regression

$$w(x, x_o) = e^{-\frac{(x-x_o)^2}{2\tau^2}}$$

$$\hat{\beta}(x_o) = (X^T W X)^{-1} X^T W y$$



Few things to know about Numpy

- **.T** returns the transpose of the matrix
- **.I** returns the inverse of the matrix
- **.shape()** returns the shape of the matrix
- **.mat()** returns a 2D array
- **.exp()** this function acts as a exponent
- **.zeros(n)** returns an array with n zeros

- **.ones(n)** returns an array with n ones
- **.argsort()** sorts the array
- **.eye()** The eye tool returns a 2-D array with 1’s as the diagonal and 0’s elsewhere.
- **.hstack()** function is used to stack the sequence of input arrays horizontally (i.e. column wise) to make a single array.

Few Examples of .eye() and .hstack()

.hstack() .eye()

```
Matrix b :
 [[ 1.  0.]
 [ 0.  1.]]
```

```
1st Input array :
 [1 2 3]
2nd Input array :
 [4 5 6]
Output horizontally stacked array:
  [1 2 3 4 5 6]
```