**Assignment 3: Locally Weighted Regression (LWR)**

**Total Marks: 10 Marks**

In this assignment, you will implement the Locally Weighted Regression (LWR) model from scratch, without using any external libraries, to achieve the same results seen in the "locally weighted regression. ipynb" file on Canvas.

**Objective:**

Recreate the Locally Weighted Regression (LWR) model using core Python and mathematical operations (e.g., NumPy). You will implement LWR to model the relationship between input features and output labels by weighting each training example according to its proximity to the query point.

**Task 1: Implement the LWR Algorithm (5 marks)**

* Implement the LWR algorithm from scratch to make predictions for any query point.

*Ensure that the algorithm weights each training example according to its proximity to the query point, as taught in class.*

**Task 2: Evaluate Your Model (3 Marks)**

* Plot the original data points along with the predicted regression line generated by your Locally Weighted Regression model.

**Task 3: Analyse the Effect of τ (2 Marks)**

1. Tune τ:
   * Try different values of the bandwidth parameter τ and analyse how it affects the smoothness of the predictions.
2. Explain Your Results:
   * Write a brief explanation of how τ influences the regression line. What happens when τ is too large or too small?

**Submission:**

* Submit your implementation in a Jupyter Notebook (.ipynb) file.
* Your notebook should contain:
  1. A clean, documented implementation of the Locally Weighted Regression algorithm.
  2. Plots of the data points and the LWR regression line.
  3. A short explanation of your results.

**Useful Resources:**

* Review the "locally weighted regression.ipynb" notebook on Canvas for guidance.
* Refer to previous lab notebooks for examples.

Note:

For this assignment you are given the liberty to look at implementations of locally weighted regression model online **(it should not be AI generated)**. Any online article, or paper you get inspiration from, must be referenced by providing a link to the material.

**Good luck!**