ID5030- Machine learning for Engineering and science applications

Homework 2 – Linear Regression - Normal Equations

Assignment Given on : Jan 27, 2023

Due Date : Feb 2, 2023 (Online submission)

Context : The purpose of this assignment is to

a) Understand the normal equations approach to linear regression
b) Understand the basics of regularization.
c) Understand the limitations of feature engineering.

We will use the same example as Assignment 1 and try modifying it with different models for this purpose.

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Consider the Concrete Compressive Strength dataset from the first assignment ((For the downloading of the dataset please refer to this Link.)

1. Write a Python program to solve the linear regression problem using the Normal Equations approach. Compare your results with the results you obtained in the last homework assignment.
2. Introduce L2 regularization into the model and solve this for various values of the regularization parameter.
    a. Do your results improve or degrade in quality?
    b. Explain the increase or decrease in quality obtained in part a in a sentence or two.
3. We now use a quadratic model instead of the linear model.
    a. How many features does the input have now?
    b. Modify your program for this quadratic model now (without regularization)
    c. Do your results improve or degrade in quality?
    d. How many features would you need if this was a cubic model instead of quadratic? (You need not program the cubic model)

4. We will provide details of the submission process later in class.