MIOT H6014

Statistical Analysis for Engineers

Assignment 4 on Hypothesis Testing

Summary

This assignment will consider a list of data values for a regression problem; the student will carry out an appropriate test to see whether some or all of the explanatory variables are needed.

Assignment Question

It is to be determined whether the fruit yield of tomato plants depends on the amount used of four additives for the soil. The regression model shown here will be applied:

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4,$$

where Y is the weight of fruit yielded, X_i is the amount in appropriate units of additive i, for i = 1 to 4, and the numbers β_i are the corresponding coefficients for each additive.

1. Write out equations for the elements $X^{\mathrm{T}}X$ and $X^{\mathrm{T}}Y$ in the equation for the pseudo-inverse OLS estimator for (α, β_i). These elements should be written in terms of the Y_i and $X_{i,j}$.
2. Use these results to calculate the OLS estimator b for the data given at the end of the assignment document.
3. Set up the Null and alternative Hypothesis and other elements of the test to investigate whether the last two variables are required to 'explain' Y.

4. Repeat this work to investigate whether all four variables are required to ‘explain’ *Y*.

Submission

If you carry out your calculations in a spreadsheet, you should save the spreadsheet as a PDF before submitting. Make sure all calculations are fully explained. If you carry out the assignment using a computer program, you can email the program to me as fulfilment of the assignment.

Data

The data is given in the text file ‘Assignment4-data.txt’.