

Linear Statistical Models

Week-9 & 10: Graded Assignment

Subjective Assignment: (Manual-grading)

Max. Marks: 35

Note: *R* is required for this assignment.

1. The dataset ‘*InsectSpray*’ has data on the count of insects in areas treated with one of 6 different types of sprays.

Note: The dataset is already in the proper format for the one-way analysis of variance – a vector with the data (count), and one with a factor describing the level (spray).

Based on the given information, answer the following questions:

- (a) Import dataset in *R*, using the following command: [1 Mark]
`require(datasets); data(InsectSprays)`
 - (b) Using *R*, plot a side-by-side box plot to see if the treatment means are equal. [3 Marks]
 - (c) Perform a one-way ANOVA to check if the treatment means are equal. Do they agree? [5 Marks]
2. A manufacturing company has purchased three new machines of different types, say, m_1, m_2 and m_3 . Owner of the company wants to analyse the effectiveness of the machines for which he wants to observe the five outputs from each machine.
 - (a) Simulate 50 positive values from discrete uniform distribution for machine m_1 . Repeat it for m_2 and m_3 by varying parameters of the distribution. [2 Marks]
 - (b) Consider the following models:
 - $y_{ij} = m_i + \epsilon_{ij}$
 - $y_{ij} = 3 + 4m_i + \epsilon_{ij}$
 - $y_{ij} = -1 + 2m_i + \epsilon_{ij}$

Note: Simulate error terms, ϵ_{ij} from the $N(0, 1)$ distribution and use the simulated values of part (a).

Store the values in the data frame with two columns, i.e. Machine type and Effectiveness score (y_{ij} ’s). [3 Marks]
 - (c) Define null and alternative hypotheses to perform one-way ANOVA. [3 Marks]
 - (d) For each of the model, write an *R* - code (from scratch) to perform one-way ANOVA and comment on the obtained result about acceptance/ rejection of hypothesis. [10 Marks]

- (e) For each of the above-mentioned models, perform one-way ANOVA by using inbuilt function in [R](#). Comment on the obtained result and compare with the outputs obtained in part (e). [8 Marks]