Analysis of Variance (ANOVA)

Two Types of Study:

- Observational Study observes individuals and measures variables of interest but does not attempt to influence the responses.
 - > This type of study can also establish association between a factor and the response variable.
- Designed Experiments deliberately imposes some treatment on individuals in order to observe their responses.
 - > This type of study can also establish cause and effect (between a factor and the response variable).

Examples of Designed Experiment

- Example 1 : Consider the problem of comparing the effectiveness of 3 kinds of diets (A, B, C). Forty males and 80 females were included in the study and were randomly divided into 3 groups of 40 people each. Then a different diet is assigned to each group. The body weights of these 120 people were measured before and after the study period of 8 weeks and the differences were computed.
- Example 2 : In a classic study, described by F. Yates in the *The Design and Analysis of Factorial Experiments*, the effect on oat yield was compared for three different varieties of oats (A, B, C) and four different concentrations of manure (0, 0.2, 0.4, and 0.6 cwt per acre).

Terminologies in Experiments

- Experimental Units These are the individuals on which the experiment is done.
 - Subjects human beings.
- Response variables Measurement of interest.
- Factors Things that might affect the response variable (explanatory variables). {new drug}
- Levels of a factor {different concentration of the new drug; no drug, 10 mg, 25 mg, etc.}
- Treatment A combination of levels of factors.
- Repetition putting more than one experimental units in a treatment.

Example 1 : Diet Study

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a) Experimental units :

- b) Response variable :
- c) Factor(s):
- d) Levels :
- e) Treatments :

Example 2 : Oat Yield Study

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Designs of Experiments

- Completely Randomized Experimental units are allocated at random among all treatments, or independent random samples are selected for each treatment.
- Double-Blind Study Neither the subjects nor the medical personnel know which treatment is being giving to the subject.
- Matched Pair Used for studies with 2 treatment arms, where an individual from one group is matched to another in the other group.
- Block Design The random assignment of units to treatments is carried out separately within each block.
 - Block is a group of experimental units that are known to be similar in some way that is expected to affect the response to the treatment.

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Block - Gender