STA 3180 Statistical Modelling: Experimental Design

Experimental Design Lecture Notes

Introduction

Experimental Design is a branch of statistics that deals with the design and analysis of experiments. It is concerned with the planning, conducting, analyzing and interpreting of experiments in order to obtain reliable and valid data. The purpose of experimental design is to ensure that the experiment is conducted in a way that maximizes the accuracy and precision of the results.

Key Concepts

- **Randomization**: Randomization is a process by which the experimenter assigns treatments to experimental units in a random manner. This helps to reduce bias and ensures that the effects of treatments are not confounded with other factors.

- **Replication**: Replication is the process of repeating an experiment multiple times in order to increase the reliability of the results.

- **Blocking**: Blocking is the process of grouping similar experimental units together in order to reduce the effects of extraneous variables.

- **Factorial Design**: Factorial design is a type of experimental design in which two or more factors are varied simultaneously. This allows the experimenter to study the effects of each factor individually as well as the interactions between them.

Definitions

- **Experiment**: An experiment is a procedure designed to test a hypothesis or answer a research question.

- **Treatment**: A treatment is a variable that is manipulated by the experimenter in order to observe its effect on the response variable.

- **Experimental Unit**: An experimental unit is an entity that is assigned to a treatment in an experiment.

- **Response Variable**: A response variable is a variable that is measured in order to assess the effect of a treatment.

- **Extraneous Variable**: An extraneous variable is a variable that is not of interest to the experimenter but may influence the results of the experiment.

Practice Multiple Choice Questions

Q1. Which of the following is not a key concept of experimental design?

A. Randomization

B. Replication

C. Stratification

D. Blocking

Answer: C. Stratification