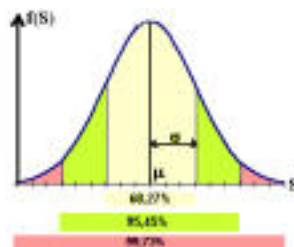
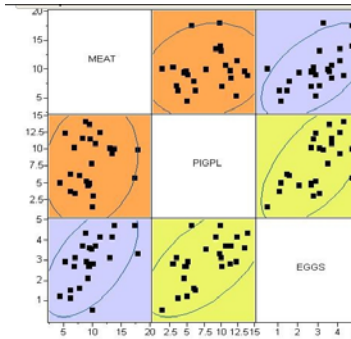

INTRODUCTION TO STATISTICS



Fundamental Tools in Statistics



Learning Objectives:

- Understand the difference between descriptive and inferential statistics
- Appreciate the value of exploratory methods in preliminary data analysis
- Explore, characterize and identify problems in data using graphical tools
- Use descriptive statistics to summarize data
- Master the concepts of hypothesis testing, confidence intervals, risk and power
- Perform the appropriate statistical test based on the study objective
- Analyze data more quickly and more accurately
- Interpret results reliably and confidently

Target Audience:

This applied training session in statistics is aimed at all scientific staff who collect data and who must make decisions based on them.

Introduction

Descriptive Data Analysis

Types of Variables

- Classification of Variables According to the Values They Take

- Classification of Variables According to the Role They Play

- Handling Different Types of Variables

- Summary Table: Types of Variable and Role in the Experimental Process

Visualizing Data: the Concept of a Distribution

- Definition of a Distribution

- Examples of Distributions for Discrete Variables

- Example of Distribution for a Continuous Variable

Characterizing Distributions

- Other Characteristics of a Distribution

- Box-Plots: Graphical Representation of a Distribution

- A Quick Word on Outliers

Exploratory Descriptive Analysis

- Relationship between Two variables: Generalities

- Correlation: The Relationship between Two Continuous Variables

- The Relationship between Discrete and Continuous Variables

- Simultaneous Analysis of the Relationship between Several Variables

Statistical Inference

Overview

Statistical Inference with Hypothesis Testing

Step 1: Define Research Objective and Acceptable Levels of Risk

Step 2: Define Hypotheses (Translate Objective into Statistical Terms)

Step 3: Collect Data and Compute Test Statistic

Step 4: Establish Decision Rule: To Reject or Not to Reject H_0 , THAT is the Question!

Step 5: Draw Conclusions

The Concepts of Risk and Power

Examples

Statistical Inference with Confidence Intervals

Philosophy

The Interpretation of a Confidence Interval

Confidence Interval Computation

Three Approaches to Finding Confidence Intervals

Distinction between Standard Deviation and Standard Error

Statistical Inference for a Single Sample: Hypothesis Test vs Confidence Interval Approach

Comparison of Hypothesis Testing and Confidence Intervals for the Population Mean

Statistical Inference: a Summary

Conclusions