

Applied Statistics for Engineers and Scientists

Overview

Statistics is undoubtedly one of the most useful of all disciplines, since virtually all organizations have data from which inferences must be drawn. In this course you will learn the fundamental concepts of applied statistics including descriptive statistics, confidence intervals, hypothesis tests, regression analysis, and analysis of variance, and be able to apply them *immediately* to the problems that you encounter on the job. This will be accomplished by lectures that carefully explain each statistical technique and then illustrate it by one or more examples using real-world data. This is reinforced by an extensive number of in-class exercises that students perform using Excel.

Whether you are new to statistics or looking for a refresher course, you will find this live seminar a great way to get up to speed in just four days. Internet courses where you read a book or PowerPoint slides on your own can simply not compare! Versions of this seminar have been presented to Caterpillar, Institute of Industrial & Systems Engineers (IISE), Lockheed Martin, the U.S. Army, and the U.S. Navy (four times).

Outline

1. Introduction

- Populations and samples
- Types of data

2. Random Variables and Probability Distributions

- Discrete random variables (Bernoulli, binomial, and Poisson)
- Continuous random variables (normal, t , F , exponential, gamma, and lognormal)
- Characteristics of a random variable (mean, median, variance, standard deviation)

3. Point Estimation

- Unbiased estimator
- Variance of a point estimator
- Estimators for the mean and variance

4. Descriptive Statistics

- Graphical plots (histogram, box plot, scatter plot)
- Numerical summaries (sample mean, variance, and skewness)

5. Confidence Intervals Based on a Single Sample

- Correct interpretation
- For large sample sizes
- For normally distributed data
- Intervals for means and proportions

6. Hypothesis Tests Based on a Single Sample

- Hypotheses and test procedures
- Type I error, type II error, and power
- P -values
- Tests for means and proportions
- Shortcomings

7. Inferences Based on Two Samples

- Hypothesis tests and confidence intervals
- Comparing two means
- Comparing two proportions

8. Regression Analysis

- Linear regression models with one or more independent variables
- Estimating model parameters
- Validating the model

9. Analysis of Variance (ANOVA)

- Testing equality of three or more means
- Determining which means are different