R for Statistical Analysis

Taught by Dr. John Verzani

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Aim of Course:
In this online course, "R Statistics," you will "Learn R via your existing knowledge of basic statistics". "R Statistics" does not treat statistical concepts in depth. After completing this course, students will be able to use R to summarize and graph data, calculate confidence intervals, test hypotheses, assess goodness-of-fit, and perform linear regression.

See related course (right) "R Programming - Introduction 1," for an introduction to programming in R.

Course Program:

WEEK 1: The One-Sample T-Test in R

- A manual computation
  - A data vector
  - The functions: mean(), sd(), (pqrd)qnorm()
  - Finding confidence intervals
  - Finding p-values
  - Issues with data
    - Using data stored in data frames (attach()/detach(), with())
    - Missing values
    - Cleaning up data
- EDA graphs
  - Histogram()
  - Boxplot()
  - Densityplot() and qqnorm()
- The t.test() function
- P-values
- Confidence intervals
- The power of a t test

WEEK 2: The Two-Sample T-Tests, the Chi-Square GOF test in R

- GUI's
  - Rcmdr
  - PMG
- Tests with two data vectors x, and y
  - Two independed samples no equal variance assumption
  - Two independed samples assuming equal variance
  - Matched samples
  - Data stored using a factor to label one of two groups; x ~ f;
  - Boxplots for displaying more than two samples
  - The chisq.tests
    - Goodness of fit
    - Test of homogeneity or independence

WEEK 3: The Simple Linear Regression Model in R

- The basics of the Wilkinson-Rogers notation: y ~ x
- * y ~ x linear regression
  - Scatterplots with regression lines
  - Reading the output of lm()
  - Confidence intervals for beta_0, beta_1
  - Tests on beta_0, beta_1
- Identifying points in a plot
- Diagnostic plots

WEEK 4: Bootstrapping in R, Permutation Tests

- An introduction to bootstrapping
- The sample() function
- A bootstrap sample
- Forming several bootstrap samples
  - Aside for loops vs. matrices and speed
    - Using the bootstrap
    - An introduction to permuation tests
    - A permutation test simulation

HOMEWORK:
Homework in this course consists of short answer questions to test concepts and guided data analysis problems using software.

In addition to assigned readings, this course also has practice exercises, supplemental readings available online, and an end-of-class project.

RELATED COURSES

- R PROGRAMMING - INTERMEDIATE
- R PROGRAMMING - INTRODUCTION 1