

RMTD 580
Introduction to Statistical Modeling with R

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Conceptual framework and course goal

This course equips students with knowledge and hands-on experience for conducting valid quantitative research. Through the conduct of reliable research and responsible scientific reporting practices, researchers can help further the scholarly understanding of the events and practices that influence the field of education so that all individuals no matter their ability, race, religion, socioeconomic status, age or gender have the opportunity to maximize their potential.

R is an open-source environment and programming language. Historically, statistical computing has been conducted using license-driven packages such as SPSS, SAS, Stata, and Matlab. The goal of this course is not to discourage the use of these packages (or others) but rather to provide a fundamental set of programming skills with which to compliment your currently preferred statistical computing packages through the use of R.

Specifically we will work through the course text books, implementing common statistical techniques such as t-tests, simple regression, correlation, ANOVA, ANCOVA, probability distributions, and power analysis. It is assumed that the conceptual underpinnings of these applications are understood and thus the goal of this course will be the implementation of these techniques in the R environment. Additionally, students will learn basic programming within R such as simulation, model and function building. Finally, students will learn basic and advanced graphical displays of data through the R environment with which to effectively translate data and research findings.

Data used in this course will largely be provided by the packages we use, although we will also use “real world” educational data provided by NELS: 88 and ECLS.

Required text

Dalgaard, P. (2008). Introductory statistics using R (2nd ed.). New York, NY: Springer.

Wickham, H. (2009). ggplot2: Elegant graphics for data analysis. New York, NY: Springer.

Homework

The best way to learn R is through continual practice. As we work through the course texts, students will be assigned weekly problem sets either from the books or the instructor. Students are expected to complete these assignments on time.

All homework will be submitted to Blackboard. Given the programming nature of this course, students are to submit two documents for each homework assignment. First, they will paste their results in a Word file along with any annotation or explanations that may be requested for specific problems. Second, students will submit a text file containing the exact code with which they used to generate their results (more on this later).

Please use the following file naming format for all homework submission in Blackboard:

hw1_results_t.pigott.doc

hw1_code_t.pigott.txt

Final Paper/Project

Throughout the semester students will develop and plan a small-scale study of their choice. Data for this study can come from a dissertation in progress, faculty research projects, or can be provided by the instructor (e.g. NELS: 88 or ECLS). A substantive topic of interest will be formulated just as you would for any other paper or publication although all analyses will be conducted within R with several minimal requirements (more on this later).

Evaluation

Grades will be based on points accumulated on homework and examinations. There will be 100 total possible points, distributed as follows:

Homework 75%

Final Project 25%

Tentative schedule (D=Dalgaard; W=Wickham)

Dates	Topics	Readings	HW due
08/31/10	Syllabus & Brief Intro to R	NA	NA
09/07/10	Introduction to R	(D: Ch. 1, Ch. 2)	
09/14/10	Probability Distributions and Descriptive Statistics	(D: Ch. 3, Ch. 4)	HW1
09/21/10	One- and Two-Sample Tests and Regression and Correlation	(D: Ch. 5, Ch. 6)	HW2
09/28/10	Analysis of Variance and Tabular Data	(D: Ch. 7, Ch. 8)	HW3
10/05/10	Power and Advanced Data Handling	(D: Ch. 9, Ch. 10)	HW4
10/12/10	Multiple Regression and Linear Models	(D: Ch. 11, Ch. 12)	HW5
10/19/10	Logistic Regression and —Other	(D: Ch. 13)	HW6
10/26/10	NO CLASS		
11/02/10	Introduction to ggplot2	(W: Ch. 1, Ch. 2)	HW7
11/09/10	Mastering the ggplot2 Grammar and Layering Plots	(W: Ch. 3, Ch. 4)	HW8
11/16/10	Toolbox and Scales, Axes, and Legends	(W: Ch. 5, Ch. 6)	HW9
11/23/10	Positioning and Polishing Plots for Publication	(W: Ch. 7, Ch. 8)	HW10
11/30/10	Manipulating Data and Reducing Duplication		
12/07/10	Special Topics: Multi-Level Modeling		

*I reserve the right to modify this syllabus throughout the semester as needed

Other important issues**Academic Honesty**

Academic honesty is an expression of interpersonal justice, responsibility and care, applicable to Loyola University faculty, students, and staff, which demands that the pursuit of knowledge in the university community be carried out with sincerity and integrity. The School of Education's Policy on Academic Integrity can be found at:

http://www.luc.edu/education/academics_policies_integrity.shtml. For additional academic policies and procedures refer to: http://www.luc.edu/education/academics_policies_main.shtml

Accessibility

Students who have disabilities which they believe entitle them to accommodations under the Americans with Disabilities Act should register with the Services for Students with Disabilities (SSWD) office. To request accommodations, students must schedule an appointment with an SSWD coordinator. Students should contact SSWD at least four weeks before their first semester or term at Loyola. Returning students should schedule an appointment within the first two weeks of the semester or term. The University policy on accommodations and participation in courses is available at: <http://www.luc.edu/sswd/>

Harassment (Bias Reporting)

It is unacceptable and a violation of university policy to harass, discriminate against or abuse any person because of his or her race, color, national origin, gender, sexual orientation, disability, religion, age or any other characteristic protected by applicable law. Such behavior threatens to destroy the environment of tolerance and mutual respect that must prevail for this university to fulfill its educational and health care mission. For this reason, every incident of harassment, discrimination or abuse undermines the aspirations and attacks the ideals of our community. The university qualifies these incidents as incidents of bias.

In order to uphold our mission of being Chicago's Jesuit Catholic University-- a diverse community seeking God in all things and working to expand knowledge in the service of humanity through learning, justice and faith, any incident(s) of bias must be reported and appropriately addressed. Therefore, the Bias Response (BR) Team was created to assist members of the Loyola University Chicago community in bringing incidents of bias to the attention of the university. If you believe you are subject to such bias, you should notify the Bias Response Team at this link: <http://webapps.luc.edu/biasreporting/>

Technology and Statistical Computing

While no previous programming experience is assumed, we will be using SPSS and R to carry out the relevant analyses in this course. You are expected to know how to navigate the university's email system as well as Blackboard. Course materials will be stored on Blackboard as well as special announcements. I will assume your university email account to be your primary email account (and this is where Blackboard announcements will be sent).

Diversity

This course and your programs are committed to diversity including but not limited to race, gender, sexual orientation, social class, ethnicity, and ability. Through this course, you will learn how to interpret and critique fundamental quantitative methods used in the social sciences. You will be provided with an introductory set of quantitative tools necessary to investigate (and evaluate the research of) the social dimensions mentioned above.