

**PSY148A**

**Applied Statistical Computing using R**

**Department of Psychology  
Brandeis University  
Summer 2018**

**Dr. Xiaodong Liu**

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Course time/location: TBD, Goldfarb library 230

Instructor: Xiaodong Liu, [xliu0806@brandeis.edu](mailto:xliu0806@brandeis.edu), Brown 106, 781-736-3244 (O).

Office hours: by appointment

**Course Description**

This course has two main goals: 1) it is designed for students who would like to learn to do statistical computing, programming, and graphical presentation in R; 2) it is designed for students with some background in descriptive and inferential statistics who would like to further their understanding of inferential statistics and statistical modeling.

R is the platform for this course. It will be introduced in a way that helps make the connection between statistical concepts, modeling, and their implementation. In addition, through R programming, students will learn to document the analytic process for reproducibility of research work. Topics of statistical computing include methods of describing data, numerical summary and graphical presentation of data, computing of probability or quantiles based on given distributions (including Gaussian distribution, t-distribution, F-distribution, Chi-square distribution, binomial distribution, and Poisson distribution), simulation and data generation, and writing functions for custom statistics. While the main theme of this course is on statistical computing with R, we will emphasize the applied aspect through using data from empirical studies.

Guided by the pedagogical principles of experiential learning, the courses aim for students not only to learn significant course content, but also to refine their quantitative thinking skills, to apply the concepts and facts that students learned to new situations, and to empower students to act responsibly in their future roles related to data reading, understanding, and interpreting.

**Course Credits:**

This is a four-credit course. Success in this four-credit hour course is based on the expectation that students will spend a minimum of 9 hours of study time per week in preparation for class (readings, papers, discussion sections, preparation for exams, etc.).

## Learning Objectives and Expected Skill Development

Students who successfully complete this course will be able to set up and use R for a variety of tasks. Specifically, students will be able to:

- document the working process (e.g. statistical analyses that have been done) using R
- understand R environment/workspace and data types in R
- read data in different formats into R and manipulate data as desired
- export data from R to desired formats
- write program/scripts to generate numerical summary of data
- write program/scripts to present data graphically
- compute probability or quantiles given a distribution
- generate random data based on a given distribution or hypothesized statistical model
- write functions to do customized analyses or generate non-standard statistics (e.g. a function to compute adjusted-correlation coefficient based upon sample size)
- implement a general linear model (e.g. regression model and ANOVA model) in R

## Prerequisites

No prior R experience is required. Some introductory statistics experience (e.g., Psyc51a or an equivalent course) will be helpful.

## Class Format

Class meetings will consist of lectures and demonstration, and in-class programming practices.

## Texts

No required textbook for this course. Materials and additional readings will be given on a weekly basis. The following books are recommended for those who would like extra materials.

Crawley, M. J. (2013). *The R Book*. Hoboken, N.J.: John Wiley & Sons Inc. (online version is available through Brandeis library)

Braun, J. & Murdoch, D.J. (2007). *A first course in statistical programming with R*. Cambridge: Cambridge University Press. (online version is available through Brandeis library)

Larry, P. (2012). *Beginning R an introduction to statistical programming*. New York: Apress. (online version is available through Brandeis library)

## Course requirements and assessment:

Students enrolled in this course will be expected to:

- ✚ contribute to the course through class participation (attending classes, asking/answering questions, offering comments) (10%)
- ✚ complete at least eight assignments by the designated deadline (65%)
- ✚ complete a final project (25%)

- ✚ All the assignments have to be submitted by the due date, late submission will not be accepted (unless with documented emergency).

### Guideline for letter grade:

95 & above	A
90 - < 95	A-
85 - < 90	B+
80 - < 85	B
75 - < 80	B-
70 - < 75	C+
65 - < 70	C
60 - < 65	C-
Below 60	Fail

### Academic integrity

Academic integrity is central to the mission of educational excellence at Brandeis University. Each student is expected to turn in work completed independently, except when assignments specifically authorize collaborative effort. **It is not acceptable to use the words or ideas of another person – be it a world-class philosopher, your fellow classmate, or your online helper – without proper acknowledgement of that source.** This means that you must use author citations, endnotes, and, where appropriate, quotation marks to indicate the source of any phrases, sentences, paragraphs, or ideas found in published volumes, on the internet, or created by another student.

Violations of University policies on academic integrity will result in failure in the course, and/or result in suspension or dismissal from the University. If you are in doubt about the instructions for any assignment in this course, it is your responsibility to ask for clarification.

### Collaboration

Students are welcome to discuss the course's materials, practices, and homework assignments with each other (for better understanding and learning). But **the work submitted for grading MUST be your own.** For example, you must write your own code, run your own data analyses, and explain the results in your own words and with your own graphical presentations. You may not submit the same or similar work to this course that you have submitted or will submit to another course or for another project. You may not provide or make available solutions to practices/homework assignments to other students who are taking this course or may take this course in the future.

### Accommodations

Students with a documented disability on record at Brandeis University and wishing to have a reasonable accommodation made for this class should let me know the needs **in the first week of the course or as soon as possible.** Students should then provide me a proposed accommodation

with appropriate document, if any. A mutually agreed arrangement will then be documented and be followed for this course.

### **Rules of using computer/cell phone in class time**

The use of cell phone is prohibited during class time.

Computer (including laptop, ipad etc.) can only be used for taking class notes. Computer can be used for statistical computing only when I ask you to do so.

**I assume that you are here because you want to learn. Using a cell phone or laptop, or computer to talk, text, email, or surf the web on non-course related matters is disrespectful to me and to your fellow students.**

I will ask you to turn off the computer or leave the classroom if the computer or phone is used for any work unrelated to the class in session (including homework for this course). No exceptions.