Fundamentals of Modern Data Science with R (DSCI 101)

Fall 2023

LOYOLA UNIVERSITY CHICAGO

Preparing people to lead extraordinary lives

Course Description

This course provides students with an introduction to data science using the R programming languages covering such topics as data wrangling, data visualization, principles of reproducible research, building simple statistical models/machine learning and data science ethics.

Prerequisites: None

Instructor

Mena CR Whalen, PhD
Assistant Professor
✉ mwhalen3@luc.edu
☎ 773.508.3580
📍 Loyola Hall (Office 108)

When: Monday Wednesday 4:15 - 5:30 pm

Location: Cuneo Hall Rm 210

Office Hours: Loyola Hall (Office 108)
TBA Message on campuswire for appointment

Make individual appointment/meeting requests through Campuswire (discussed below) by selecting *Post to instructors*.

Course Structure

- Reading: Readings are posted in the tentative schedule that should be read *before class*. Come to class prepared to solidify the readings through lecturing and group activities.
- Class Time: Class will be composed of lecturing, discussions, collaborative activities, and R practice. Please come to class having done the reading, a charged computer, and ready to discuss and learn in a collaborative manner.
- Assessments: Students will complete homeworks, take a midterm, 1 project, and a final.
- Participation, Discussion, and Group Work: One important aspect of a Jesuit education is learning to respect the rights and opinions of others. Please respect others by (1) allowing all classmates the right to voice their opinions without fear of ridicule, and (2) not making objectionable (gendered, racial or ethnic) comments, especially comments directed at a classmate. Group work and discussion are vital to this class since no one student will understand everything, please lean on each other for help and learn to hear concepts and ideas from another perspective.

Textbook

REQUIRED Modern Data Science with R (2nd edition). Baumer, Kaplan, and Horton

PDF of Book: https://beanumber.github.io/mdsr2e/index.html

Recommended Grolemund, G., & Wickham, H. (2017). R for Data Science. O'Reilly Media.

PDF of Book: https://r4ds.had.co.nz/

R and Posit (formerly RStudio)

WE WILL BE USING/INTRODUCING the free statistical software R. While R is the engine, we will use the free and open source IDE (Integrated Development Environment) RStudio to run it. R and RStudio are set up and available on all library computers.

R: Version 4.2.3, "Shortstop Beagle", https://cran.rstudio.com/

Posit Version "2023.06.1-524", https://posit.co/

Asking Questions & Course Communication

This term we will be using Campuswire as our preferred platform for questions about homework, reading checks, R questions and general course questions. The system is highly catered to getting you help quickly and efficiently from classmates and the instructor. Rather than emailing questions to the instructor, you should post your questions on Campuswire. You can ask and answer questions anonymously on the site.

I will check Campuswire periodically and answer questions[1], but I strongly encourage students to answer each other's questions.

Enrollment Code: 7363

Questions concerning individual grades should be addressed through email.

[1] Please do not expect answers during weekends and evenings.

Evaluation

STUDENTS WILL BE EVALUATED through (1) Homework; (2) Midterm; (3) Project (4) Final.

Exams

There will be one midterm exam and one final for the semester. Both exams may not be made up unless there is a serious reason for missing and arrangements are made prior to the test. The midterm will be an in-class exam that is cumulative up to that point in class. Final will be cumulative. Both exams would incorporate interpretations and outputs from R.

Homework

Homework is due approximately every other week. Discussion between classmates is encouraged; however, the final work should be independent. Home-

work must be submitted through Sakai. Homework turned in after the due date will receive no credit. To help your final grade, please avoid late homework.

Project

The individual project will require students to find a raw data set, wrangle the data into a useful format, perform some interesting analysis, and present results in a written report following the principles of reproducible research. All code must be version controlled through github (or repository of your choice) and a link to the repository must be submitted along with the final report.

More specific details on the project presentations and reports will be given at a later date but note that the project will have multiple due dates throughout the entire semester.

Grading

Grading Scale	
93 - 100%	A
90 - 92.9%	A-
87 - 89.9%	B+
83 - 86.9%	B
80 - 82.9%	B-
77 - 79.9%	C+
73 - 76.9%	C
70 - 72.9%	C-
67 - 69.9%	D+
60 - 66.9%	D
Below 60%	F

Category	Weight
Homework	25%
Midterm	25%
Final	25%
Project	25%

Final grades will be rounded to nearest tenth of a percent. I reserve the right to alter the course grading scale. However, any alterations will be limited to those that would be beneficial to students (i.e. an upward grade curve).

Student Academic Services

Tutoring

The www.luc.edu/tutoring embodies the mission of Loyola University Chicago by providing academic services and resources which foster development of skills and attitudes necessary to increase the knowledge and academic independence of all students. Through multiple learning services, the Tutoring Center helps to contribute towards student success and growth efforts that are made by Loyola University Chicago.

Accommodations

Loyola University provides reasonable accommodations for students with disabilities. Any student requesting accommodations related to a disability or other condition is required to register with \href{Student Accessibility Center (SAC), located in Sullivan Center, Suite 117. Students will provide professors

with an accommodation notification from SAC, preferably within the first two weeks of class. Students are encouraged to meet with their professor individually in order to discuss their accommodations. All information will remain confidential. For more information or further assistance, please call 773.508.3700 or email sac@luc.edu.

Academic Integrity

Academic dishonesty can take several forms, including, but not limited to cheating, plagiarism, copying another student's work, and submitting false documents. Academic cheating is a serious act that violates academic integrity. Cheating includes, but is not limited to, such acts as

- Obtaining, distributing, or communicating examination materials prior to the scheduled examination without the consent of the teacher
- Providing information to another student during an examination
- Obtaining information from another student or any other person during an examination
- Using any material or equipment during an examination without consent of the instructor, or in a manner which is not authorized by the instructor
- Attempting to change answers after the examination has been submitted
- Unauthorized collaboration, or the use in whole or part of another student's work, on homework, lab reports, - programming assignments, and any other course work which is completed outside of the classroom Falsifying medical or other documents to petition for excused absences or extensions of deadlines
- Any other action that, by omission or commission, compromises the integrity of the academic evaluation process
- For more details on Loyola's Academic Integrity Statement please see here.

Intellectual Property

All lectures, notes, PowerPoints, and other instructional materials in this course are the intellectual property of the professor. As a result, they may not be distributed or shared in any manner, either on paper or virtually without my written permission. Lectures may not be recorded without my written consent; when consent is given, those recordings may be used for review only and may not be distributed. Recognizing that your work, too, is your intellectual property, I will not share or distribute your work in any form without your written permission.

Recordings

In this class software will be used to record live class discussions. As a student in this class, your participation in live class discussions will be recorded. These recordings will be made available only to students enrolled in the class, to assist those who cannot attend the live session or to serve as a resource for those who would like to review content that was presented. All recordings will become unavailable to students in the class when the Sakai course is unpublished (i.e. shortly after the course ends, per the Sakai administrative schedule). Students who prefer to participate via audio only will be allowed to disable their video camera so only audio will be captured. Please discuss this option with your instructor.

The use of all video recordings will be in keeping with the University Privacy Statement shown below:

Privacy Statement

Assuring privacy among faculty and students engaged in online and face-to-face instructional activities helps promote open and robust conversations and mitigates concerns that comments made within the context of the class will be shared beyond the classroom. As such, recordings of instructional activities occurring in online or face-to-face classes may be used solely for internal class purposes by the faculty member and students registered for the course, and only during the period in which the course is offered. Students will be informed of such recordings by a statement in the syllabus for the course in which they will be recorded. Instructors who wish to make subsequent use of recordings that include student activity may do so only with informed written consent of the students involved or if all student activity is removed from the recording. Recordings including student activity that have been initiated by the instructor may be retained by the instructor only for individual use.

Diversity Equity and Inclusion

The diversity that students bring to this class, in all its forms, is viewed as a resource, a strength, and a benefit. It is my intent to invest in each student's success and attend to each student's learning needs, both in and out of class. It is my intent to present materials and activities that are respectful of diversity, equity and inclusion, and that students from all diverse backgrounds and perspectives be well-served by this course. Students in this course are encouraged to participate freely and share personal opinions, perspectives, and stories. There may be diverse, and perhaps contradictory ideas shared, in class. This variety is a strength of the academic community. Students are asked to show respect and treat peers in a way that validates various experiences and opinions based on a range of identities, including ability, economic class, eth-

nicity, faith tradition or no faith, gender identity and expression, nationality, religion, sexual orientation, veteran status, and their intersections.

Acts of bias, harassment, abuse, discrimination, relationship violence, sexual violence (i.e. sexual assault, sexual harassment, etc.), gender harassment, and stalking are not tolerated at Loyola. If you or someone you care about has experienced any one of these crimes and/or violations of LUC Community Standards, please know that you have rights, reporting options, and other support services available to you. Please visit here for more information.

Land Acknowledgement

As we come together as a learning community, we need to acknowledge the land we live and work on by naming the Muscogee Creek, Cherokee, and Chickasaw Peoples upon whose unceded and stolen territory the university stands. Also, we should acknowledge the enslaved peoples, primarily of African descent, whose labour built much of the university. Visit LUC's Faculty Center for Ignatian Pedagogy land acknowledgement page for more information.

Campus Support Services

- ITS HelpDesk ✉ `helpdesk@luc.edu` ☎ 773-508-4487
- Library
  - Subject Librarian Greer Martin
- Student Accessibility Center
- Writing Center
- Ethics Hotline ☎ 855-603-6988
- Center for Tutoring and Academic Excellence
- Bookstore
- Financial Aid
- Wellness Center
  - Mental Health Appointment First Steps
  - For urgent, non-life threatening mental health needs ☎ 773-508-2530 **option 3**

Tentative Course Schedule

DUE DATES WILL GENERALLY BE ON THURSDAYS BUT SUBJECT TO CHANGE.

WEEK	DATE	CONTENT	HW/PROJECTS
Week 01	Aug 28 (Mon)	Syllabus Day	
	Aug 30 (Wed)	CH 1 Why DSCI	
Week 02	Sep 4 (Mon)	Labor Day **No Class**	
	Sep 6 (Wed)	CH 2 Data Vis	HW 1
Week 03	Sep 11 (Mon)	CH 2 Data Vis	
	Sep 13 (Wed)	CH 3 GoG	HW 2
Week 04	Sep 18 (Mon)	CH 4 Data Wrangling	
	Sep 20 (Wed)	CH 4 Data Wrangling	
Week 05	Sep 25 (Mon)	CH 5 Joins	
	Sep 27 (Wed)	CH 6 Tidy Data	HW 3
Week 06	Oct 2 (Mon)	CH 6 Tidy Data	
	Oct 4 (Wed)	CH 7 Maps	Project Approval
Week 07	Oct 9 (Mon)	Fall Break **No Class**	
	Oct 11 (Wed)	CH 7 Maps	HW 4
Week 08	Oct 16 (Mon)	CH 8 Ethics	
	Oct 18 (Wed)	Midterm Exam	
Week 09	Oct 23 (Mon)	CH 9 Bootstrap	
	Oct 25 (Wed)	CH 9 Bootstrap	HW 5
Week 10	Oct 30 (Mon)	CH 9 Statistics	
	Nov 1 (Wed)	CH 9 Statistics	
Week 11	Nov 6 (Mon)	CH 10 Predictive	
	Nov 8 (Wed)	CH 10 Predictive	HW 6
Week 12	Nov 13 (Mon)	CH 11 Supervised Learning	
	Nov 15 (Wed)	CH 12 Unsupervised Learning	Project Plan
Week 13	Nov 20 (Mon)	CH 12 Unsupervised Learning	
	Nov 22 (Wed)	Thanksgiving **No Class**	HW 7
Week 14	Nov 27 (Mon)	CH 14 Data Vis +	
	Nov 29 (Wed)	CH 14 Data Vis +	
Week 15	Dec 4 (Mon)	CH 15 SQL	
	Dec 6 (Wed)	CH 15 SQL	HW 8