

Psychology 290

Statistical Programming in R

Spring 2026

INSTRUCTOR

Dr. Meng (Chris) Qiu

- Office: SSM 362A
- Office hours: Monday 10 AM - 12 PM (or by appointment)
- Email: mengqiu@ucmerced.edu

LECTURE TIME AND LOCATION

Tue & Thu 09:00 AM - 10:15 AM [Classroom and Office 1 Bldg, Room 264]

COURSE DESCRIPTION AND OBJECTIVES

Statistical Programming in R provides students with essential R skills for data manipulation, generation, visualization, and analysis. It focuses on data science applications while introducing key statistical concepts commonly taught in introductory graduate-level statistics courses for psychology students, with emphasis on practical R implementation. The first part of the course introduces the fundamentals of R and RStudio, including core data structures, functions, scripting practices, and reproducible reporting using R Markdown. The second part will introduce data manipulation and preprocessing methods, such as data transformation, subsetting, and combination. From a statistical perspective, students are then introduced to descriptive statistics and data visualization, followed by foundational topics in probability theory, sampling, estimation, and null hypothesis testing. Building on these foundations, the third part of the course covers commonly used inferential methods in the social sciences through case studies, including analysis of variance, linear regression, latent class analysis, and growth curve modeling. The fourth part introduces Bayesian statistical modeling using NIMBLE. The course concludes with an overview of AI-assisted R coding workflows.

By the end of this semester, students will be able to

- Understand and handle different types of data in R
- Know to how visualize and interpret data
- Conduct complex data manipulation
- Conduct data analysis using statistical techniques, such as linear regression, latent class analysis, and growth curve analysis.

RECOMMENDED BOOKS

Zhang, Z. & Wang, L. (2017). Advanced Statistics Using R. [<https://advstats.psychstat.org>]. Granger, IN: ISDSA Press. ISBN: 978-1-946728-01-2. The PDF version of the book can be downloaded here: <https://advstats.psychstat.org/book/ZhangWang2017.pdf>

Kennedy, R. & Waggoner P. (2021). Introduction to R for Social Scientists. Chapman and Hall/CRC. ISBN: 978-1-003030-66-9.

Wickham, H., & Grolemund, G. (2017). R for Data Science. O'Reilly. <https://r4ds.had.co.nz/>.

FREE ONLINE RESOURCES

Navarro, D. (2019). Learning statistics with R: A tutorial for psychology students and other beginners. The online book is freely available here: <https://learningstatisticswithr.com/book/>

Venables, W. N., Smith, D. M., & R Development Core Team. (2025). An introduction to R. The PDF version of the book can be downloaded here: <https://cran.r-project.org/doc/manuals/R-intro.pdf>

A useful reference card of many R commands can be downloaded here: <https://cran.r-project.org/doc/contrib/Short-refcard.pdf>

SOFTWARE

R: <http://www.r-project.org>

RStudio: <https://www.rstudio.com>

NIMBLE: <https://r-nimble.org/>

GRADING POLICY

Grading is based on 14 homework assignments and 1 course project.

- Homework assignments (70% of final grade):
 - Every Thursday a homework assignment will be posted on CatCourses. The assignments are due the following Monday by 11:59pm via CatCourses. You may work in groups on the homework assignments if you like. However, you should be sure that you are able to complete the assignment problems on your own. You are also responsible for your own R programming and write-up of solutions. Remember that **you will not learn anything by simply copying another student's work.**
 - A complete solution to a homework question should include the R input and output as well as your narrative answer to the question.
 - There is a strict policy of **NO makeup homework assignments** throughout the semester also **NO late work will be accepted.**
- Course project (30% of final grade):
 - **There will be a course project at the end of the semester.** Each student will come up with a research topic, propose hypotheses, find appropriate data, conduct data analysis, and test the hypotheses using the techniques learned in this course. The results of the projects will be presented in class and reported in a final report. Each student will have 15 minutes for the presentation. The report should be created using R Markdown and should be approximately 10 pages in length. **No late course project reports will be accepted.** More information on the course project will be provided around spring break.
 - **No forms of collaboration are allowed on the course project.**

To be successful in a statistics course, it is important to be familiar with the concepts and to know how to use the methods and software. The only way to achieve this is by practicing frequently. In particular for this course, learning how to use R will require a significant amount of practice outside of class.

Final grades will be assigned as follows and **no rounding and curving will be made:**

Category	Total Points	Letter Grade	Total Percentage
Homework (10 pts each)	140 pts	A	100-93%
Course project	60 pts	A-	92.99-90%
Total	200 pts	B+	89.99-87%
		B	86.99-83%
		B-	82.99-80%
		C+	79.99-77%
		C	76.99-73%
		C-	72.99-70%
		D+	69.99-67%
		D	66.99-63%
		D-	62.99-60%
		F	<60%

Incomplete Grade in Course: A grade of “I” (Incomplete) will be assigned only at the discretion of the instructor and only in the event of extraordinary circumstances. A written request must be filed and a written approval granted before the Incomplete may be taken.

THIS COURSE IS RELEVANT TO THE UC MERCED GUIDING PRINCIPLES BY TEACHING STUDENTS:

- **Scientific Literacy:** Given that the focus of this course is applied statistics, students will be taught various ways of presenting and analyzing statistical data. This knowledge will help them gain an understanding of scientific and quantitative information. They will be taught how to interpret scientific information and effectively apply quantitative tools to a variety of applied contexts. Scientific literacy will be gained through in-class discussions, quizzes, homework assignments, interactive assignments in class, and exams.
- **Decision Making:** Students will participate in in-class discussions and complete assignments related to decision-making in the context of statistical analysis. They will be taught to evaluate, interpret, and use information effectively for critical analysis and problem-solving in the context of applied statistics.
- **Ethics and Responsibility:** Ethics in statistics will be covered through lectures and assignments. Students will be taught about ethical ways of examining and reporting trends in data.

ACADEMIC INTEGRITY

Students should be familiar with university policies on academic honesty. A general code of conduct for the University of California can be found at: www.ucop.edu/ethics-compliance-audit-services/compliance/standards-of-ethical-conduct.html.

- Basically, do not cheat or plagiarize. This will earn you a very uncomfortable meeting with the professor of the course and a **ZERO** on the exam/assignment.
- **There is NO exception to this rule!!**
- Students who are caught cheating on an in-class quiz and/or an exam will be **immediately** asked to leave the class. The cheating incident will be reported to the Undergraduate Dean of Students, and a zero will be given for the score of the quiz/exam.
- Note that this policy will be upheld equally for people trying to copy work and also for people trying to help others.
- If you have questions about this policy and/or the consequences listed above, please see the professor as soon as possible.

STUDENTS WITH SPECIAL NEEDS

University of California, Merced is committed to creating learning environments that are accessible to all. If you anticipate or experience physical or academic barriers based on a disability, please feel welcome to contact me privately so we can discuss options. In addition, please contact Student Accessibility Services (SAS) at (209) 228-6996 or disabilityservices@ucmerced.edu as soon as possible to explore reasonable accommodations. All accommodations must have prior approval from Student Accessibility Services on the basis of appropriate documentation.

If you anticipate or experience barriers due to pregnancy, temporary medical condition, or injury, please feel welcome to contact me so we can discuss options. You are encouraged to contact the Dean of Students for support and resources at (209) 228-3633 or studentaffairs.ucmerced.edu/dean-students.

CLASSROOM CIVILITY

Each UCM student is encouraged to help create an environment during class that promotes learning, dignity, and mutual respect for everyone. Students who speak in inappropriate times, sleep in class, display inattention, take frequent breaks, interrupt the class by coming to class late, engage in loud or distracting behaviors, use cell phones or other electronic devices in class, use inappropriate language, are verbally abusive, display defiance or disrespect to others, or behave aggressively toward others could be asked to leave the class and be subjected to disciplinary action.

COURSE SCHEDULE

This list of topics is only an outline. As needed, topics may be added, deleted, substituted, or shifted to different weeks.

Week	Date	Day	Topic	Homework
1	1/20	Tue	Introduction to R	HW1
	1/22	Thu	Introduction to R Markdown	
2	1/27	Tue	Data manipulation 1	
	1/29	Thu	Data manipulation 2	
3	2/3	Tue	Data visualization 1	HW2
	2/5	Thu	Data visualization 2	
4	2/10	Tue	Functional programming 1: Functions	HW3
	2/12	Thu	Functional programming 2: Loops	
5	2/17	Tue	Functional programming 3: Functionals	HW4
	2/19	Thu	Exploratory data analysis	
6	2/24	Tue	Moderation analysis	HW5
	2/26	Thu	Mediation analysis	
7	3/3	Tue	Path models	HW6
	3/5	Thu	Latent variable models	
8	3/10	Tue	—	HW7
	3/12	Thu	Factor analysis models	
9	3/17	Tue	Latent class analysis (LCA)	HW8
	3/19	Thu	Multiple imputation using LCA	
10			Spring Break	
11	3/31	Tue	Growth curve analysis	HW9
	4/2	Thu	Longitudinal mediation analysis	
12	4/7	Tue	Simulation in R: Data generation	HW10
	4/9	Thu	Simulation in R: Design and run the process	
13	4/14	Tue	Simulation in R: Summarize and present	HW11
	4/16	Thu	Power analysis and sample size planning	
14	4/21	Tue	Introduction to Bayesian statistics	HW12
	4/23	Thu	Introduction to NIMBLE	
15	4/28	Tue	Case studies using NIMBLE	HW13
	4/30	Thu	Using LaTeX for academic writing	
16	5/5	Tue	Presentation 1	
	5/7	Thu	Presentation 2	