PH 718: Data Management and Visualization in R, Spring 2026

Credits: 3
Meeting Times: Tue/Thu, 16:00—17:15
Location: Zilber 119

Instructor

Instructor name: Zhiyang Zhou
Instructor email: zhou67@uwm.edu
Office Hours: By appointment, typically on lecture days.

Welcome Statement

Welcome to Data Management and Visualization in R! I'm excited to have you in this course and look forward to helping you build practical skills in working with data using R. I understand that students come from different backgrounds and experiences, and my goal is to create a respectful, inclusive environment where you're encouraged to ask questions, explore ideas, and grow. Whether you're new to coding or experienced, I'm here to support your learning every step of the way.

Course Overview

This course provides a comprehensive introduction to programming in R with a specific focus on data management and visualization. Learners will gain hands-on experience in cleaning, manipulating, analyzing, and visualizing data using a variety of R packages. The course emphasizes real-world applications, reproducible workflows, and the creation of publication-quality graphics. Students will also explore how to work with diverse file types and formats, automate data processing tasks, and apply best practices in data handling. By the end of the course, students will be equipped with practical tools to make informed, data-driven decisions and communicate findings effectively.

Course Objectives

- Introduce students to R programming syntax and data structures.
- Teach best practices for importing, cleaning, and transforming datasets using R.
- Enable students to generate informative, high-quality visualizations for exploratory and explanatory purposes.
- Develop competency in using R packages for managing and reshaping data.
- Promote reproducible research through the integration of R scripts, markdown, and version control.
- Familiarize students with key principles of effective data communication and storytelling using graphics.

Student Learning Outcomes

By the end of the course, students will be able to:

- Load, manipulate, and summarize data from various sources and formats.
- Construct clear and reproducible data analysis pipelines using R packages.
- Create static and interactive data visualizations to convey key insights.
- Apply data-cleaning techniques to prepare raw data for analysis in a reproducible way.
- Generate dynamic reports combining code, output, and narrative.

- Demonstrate ethical data handling practices, including data privacy awareness and responsible communication of findings.

Assessment

Students will be evaluated through regular assignments and R package exploration. Assessment is aligned with the stated learning outcomes and emphasizes reproducibility, practical proficiency, and clear data communication.

Prerequisites and/or Special Skills Required

[PH711(P)] or the consent of instructor.

Course Modality and Format

- **Format:** Lectures.
- **Modality:** Onsite.
- **Detail:** Active participation during class time is essential, as learning will take place through live instruction, hands-on coding, group discussions, and collaborative problem-solving.
  - Interaction with the instructor: The instructor will lead live lectures and demonstrations during each class session, introducing new concepts and walking through R code examples in real time. Students are expected to ask questions, share screens when needed, and engage in discussion during class. Office hours (by appointment) will be held after lectures for one-on-one support or deeper technical questions.
  - Interaction with peers: Students will work in breakout groups, pairs, or small teams during class to complete coding challenges, troubleshoot data issues, and review visualizations. Respectful, professional interaction is expected at all times, whether in discussion or screen-sharing activities.
  - Interaction with course content: Lecture notes and code examples will be posted before each lecture to support self-directed learning. Students are expected to review these materials in advance so that live sessions can focus on hands-on coding, clarification, and collaborative exercises. Course content is reinforced through regular assignments and in-class application, with independent practice encouraged to build proficiency in R.

Course Materials

- **Required readings:** Notes/slides regularly posted at the instructor's homepage and Canvas.
- **Recommended Readings:**
  - [R4DS] H. Wickham, M. Cetinkaya-Rundel, & G. Grolemund. (2023). *R for Data Science: Import, Tidy, Transform, Visualize, and Model Data*, 2nd Ed. Sebastopol: O'Reilly Media. (Accessible at r4ds.hadley.nz.)
  - [MD] C. Ismay, A. Y. Kim, & A. Valdivia. (2025). *Statistical Inference via Data Science: A ModernDive into R and the Tidyverse*, 2nd Ed. Boca Raton: CRC Press. (Accessible at moderndive.com/v2.)
  - [ISL] G. James, D. Witten, T. Hastie, & R. Tibshirani. (2021). *An Introduction to Statistical Learning: with Applications in R*, 2nd Ed. New York: Springer. (Accessible at www.statlearning.com.)
  - [LGA] R. Leung (2025). *Leveraging Gen AI for Machine Learning Education in Public Health*. Cham: Springer Nature. (Accessible e-copy via the UWM library https://wisconsin-uwm.primo.exlibrisgroup.com/permalink/01UWI_ML/13nukll/alma991014632422802124.)

Time Investment

This is 3-credit course, which requires a minimum of 144 hours of total time commitment over the semester. This translates to approximately 9–10 hours of work per week across 15 weeks, including both in-class and out-of-class activities. Each week, students should expect to spend their time roughly as follows: 2.5 hours in lectures, 2–3 hours reviewing pre-posted lecture materials, reading documentation, or exploring example code, and 4.5 hours completing assignments, R package exploration, or working on final projects.

Technology Requirements

Each student is expected to have regular access to a computer with a reliable internet connection. This course makes extensive use of R (cran.r-project.org), RStudio (posit.co/download/rstudio-desktop/#download), and R Markdown (rmarkdown.rstudio.com/lesson-1.html). These tools are freely available for Linux, macOS, and Windows.

Assignments & Grading

Assignment and Grading Policies

- Bi-weekly assignments (66%): Short, focused exercises designed to apply weekly concepts in R programming, data wrangling, and visualization. These assignments provide formative feedback and help students build practical fluency with R packages.
- R package exploration (34%): Students write a review of an R package not covered in class, including its purpose, functionality, and practical applications.

Grading Scheme

Assessment (Quantity)	Point Value
Bi-weekly assignments (6)	66
R package exploration (1)	34
TOTAL	**100**

Grading Scale

A	93-100
A-	90-92
B+	87-89
B	83-86
B-	80-82
C+	77-79
C	73-76
C-	70-72
D+	67-69
D	63-66
D-	60-62
F	0-59

Policies

Course Policies
- **Attendance Policies**: Though there is no penalty on absence, it is better to be present in the designated session punctually. Since the course will be delivered without any forms of recording, there is no alternative way of attendance.
- **Makeup or Late work.** No late submissions will be accepted. Timely submissions will be graded and returned within two weeks. Students with personal or medical emergencies should contact their instructor as soon as possible.
- **Academic Integrity Policy.** Academic integrity involves taking responsibility for one's own work, demonstrating honesty in academic efforts, and showing respect for the intellectual contributions of others. As members of the university community, all students are expected to understand and uphold these principles. The Joseph J. Zilber College of Public Health remains committed to maintaining high standards of academic integrity. Each student is expected to contribute to this commitment by avoiding academic misconduct, including but not limited to impersonation, plagiarism, and the use of unauthorized materials. In situations where expectations are unclear (such as whether collaboration, tools, or specific resources are permitted), seeking clarification from the instructor is encouraged. Asking questions reflects a commitment to integrity and a desire to engage responsibly with the academic process. Useful resources can be found at UWM [information on academic misconduct](). Also, please refer to [CETL's tips on academic integrity in online learning for instructors and students]().
- **Policy on Artificial Intelligence**. Students are permitted to use Generative Artificial Intelligence (GenAI) tools, such as [Microsoft Copilot](), to support their learning. These tools may assist with understanding course content, brainstorming ideas, and revising written drafts. However, final submissions for assignments and projects must reflect students' own work and should not be entirely generated by GenAI. If GenAI tools are used, proper citation is required. For guidance on citing AI-generated content, please refer to the resource on [using and citing GenAI](), provided by UWM Libraries. Taking credit for any work that is not original, whether in whole or in part, constitutes academic misconduct and may lead to disciplinary action under [UWS Chapter 14](). While GenAI can be helpful, it is essential to use them responsibly and ethically. AI-generated content may be biased, inaccurate, incomplete, or otherwise unreliable. Students must critically evaluate any output from GenAI before incorporating it into academic work.

University Policies
- **Statement on Hate/Bias Incidents:** UWM is committed to creating and supporting a campus climate that is respectful and supportive of all who study, live, or work on campus, or participate in campus activities. UWM students and employees who have been subjected to, or who have witnessed, an incident of bias or hate are encouraged to submit a [hate/bias incident report](). UWM can provide support or resources to those involved in the incident. Find more information about hate- or bias-motivated incidents, as well as UWM's Discriminatory Conduct Policy and other resources, on UWM's [hate/bias webpage]().
- **UWM Syllabus link:** The [Syllabus Links]() page details policies pertaining to students with disabilities, absences due to religious observation, students called to active military duty, incompletes, discriminatory conduct, Title IX, academic misconduct, complaint procedures, grade appeal procedures, LGBT+ resources, and final exam policies.

Resources

Academic Supports
- [Accessibility Resource Center (ARC):](#) Dedicated to providing equal access for students with disabilities to UWM's academic, social, cultural and recreational programs. ARC offers academic accommodation supports and services such as note-taking, assistive technology and exam accommodations. Students who have, or think they may have, a disability are invited to contact ARC to arrange a confidential consultation. Also, students will be allowed to complete examinations or other requirements that are missed because of a religious observance or call to active military duty.
- Canvas Support: Visit [UWM Canvas Student Support](#) or reference the official [Canvas Student Guide.](#)
- [Student Success Center](#): Student Success Center also offers one-on-one academic skills tutoring sessions to help students with time management and strategies for notetaking, studying, and test taking.
- [UWM Libraries.](#) Conduct your own research using a vast array of databases, seek help from librarians, reserve rooms for group projects, find a quiet study space, stop by the coffee shop.
- [Writing Center.](#) Meet confidentially, one-on-one, face-to-face or online in real time with writing specialists. Any subject, any project, any level.

Non-Academic Supports
[Support U.](#) Any student in need, or students that face challenges that are barriers to their education, are encouraged to contact the Dean of Students (dos@uwm.edu) for support. Support U offers wrap-around holistic support for students, including basic needs, accessing the food pantry, emergency funding, case management, and connecting to resources, etc.
- [Emergencies](#): Includes crisis and after care, details on medical withdrawals, and UWM Police.
- [Financial Resources](#): Links to Student Financial Services, scholarship information, emergency grants, and the food pantry.
- [Health Resources](#): Medical and counseling services, community resource finder, the UWM Psychology clinic, survivor support and victim advocacy.
- [Guidance and Consultation.](#) Details on appeals, parking, accommodations, and mechanisms for filing grievances.

Technology Resources
- [Student Technology Resources](#)

Careers
- [Student Experience and Talent](#)

Centers for Advocacy & Student Engagement (CASE)
- [First-Generation+ Resource Center](#)
- [LGBTQ+ Resource Center](#)
- [Military and Veterans Resource Center](#)
- [Women's Resource Center](#)

Multicultural Student Centers (MSCs)
- [American Indian Student Center](#)
- [Black Student Cultural Center](#)
- [Roberto Hernández Center](#)

- [Southeast Asian American Student Center](#)

Student Involvement
- [Event Calendar](#)
- [Student Association (Student Government)](#)
- [Student Involvement/Organizations](#)
- [Office of Undergraduate Research](#)

Important UWM Dates

Spring 2026 Dates

First day of classes	January 26, 2026
Last day to add, change to/from credit/no credit audit status	January 30, 2026
Last day to drop without a "W"	February 22, 2026
Spring break	March 22—29, 2026
Last day to drop with a "W"	April 12, 2026
Last day of classes	May 13, 2026
Study Day	May 14, 2026
Final exams begin	May 15, 2026
Grade Deadline	May 29, 2026

Instructor statement of support

I know this course may look challenging at first glance. Learning to work with data takes time, practice, and persistence. Please don't hesitate to reach out if you're struggling, stuck, or just need a nudge in the right direction. I believe each of you can succeed in this class, and I'm committed to helping you get there. Let's work together to make this a productive and supportive semester.

Calendar

Topics	Delivery Date(s)/Due Date
Syllabus Review & Introduction to R	January 27, 2026
R Basic Syntax	January 27—February 12, 2026
Assignment 1	February 15, 2026
R Markdown	February 17—February 26, 2026
Assignment 2	March 1, 2026
Basic Graphics in R	March 3—March 12, 2026
Assignment 3	March 15, 2026
Introduction to Tidyverse	March 17—April 2, 2026
Assignment 4	April 5, 2026
Exploratory Data Analysis	April 7—April 16, 2026
Assignment 5	April 19, 2026
Interactive Plotting	April 21—April 30, 2026
Assignment 6	May 3, 2026
Special topic: Imputation	May 5—May 12, 2026