

Math 3440 Statistical Programming

Prerequisite: MATH 3430

Description: Applying a statistics programming language to facilitate the exploration and visualization of data. Basic objects such as data frames, matrices, tables, and lists, and how to perform manipulations with these objects. Writing functions with looping and conditional structures. Use functions to perform simulation-based statistical algorithms. Understand and develop object-oriented programming. Develop manipulations with character data.

Textbooks and Readings

A First Course in Statistical Programming with R, W. John Braun and Duncan J. Murdoch, 2nd Edition, 2016. www.cambridge.org/9781107576469.

References for special topics (available at no cost from the BGSU library in ebook format). To find the e-book, you can search the library catalog by title or call number.

- *R by Example*, Jim Albert and Maria Rizzo, 2012. Springer.
Chapters: Regression, Simulation
- J. Faraway, "Practical Regression and ANOVA in R" on CRAN (free download) <https://cran.r-project.org/doc/contrib/Faraway-PRA.pdf>
- *Seamless R and C++ integration with Rcpp*, Dirk Eddelbuettel 2013. Springer, New York CALL NO.: QA76.76.A63 E33.2013 (*this book and corresponding R package rcpp provide a relatively painless way to link C++ compiled code with R*)
- *Advanced R*, Hadley Wickham. 2015, CRC Press CALL # QA276.45.R3 W53 2015. (*reference for debugging and profiling, and other advanced topics*)

Software and IDE (See Chapter 1)

- Most of the course topics focus on statistical programming in the R statistical software environment, which is free software provided under general public license. [Link](#)
- We use the RStudio IDE, which is also free to download. <https://www.rstudio.com/>
- Assignments will usually be submitted online and prepared using the tools available in RStudio for integrated report writing (e.g. knitr and R Markdown).
- Install the latest version of R (check current version at r-project.org)
- Install the latest version of RStudio (check for updates)

Class Participation - Laptops

- This class is designed to be interactive, and each student will need to use a laptop during class.
- The classroom contains a laptop cart with ready-to-use Dell Ultrabooks (R and RStudio installed).
- At the start of each class, boot up your personal laptop or a laptop from the cart, and open R Studio. You should also log into the course on Canvas to find the day's lesson and download the notes.
- If using one of the laptops provided in the classroom, you will need some kind of external storage for your work to take home, such as a portable (USB) drive, or cloud storage such as Dropbox or OneDrive.

- Even if you complete the Exercises during class and submit before leaving, it is highly recommended that you save your source files. (You will only submit the html report, not the sources.)

Assignments and Grading

- Exercises are due following each class (see below for the format). Exercises are brief reports that should be completed following the notes covered in class. See below for details about the format. Students may collaborate with each other in class on the exercises.
- Assignments are due each week. See below for details about the format. Students should do the assignments independently outside of class, unless assigned as group work.
- Final Project Presentations and Due Date: scheduled final exam

Format for submission of Exercises and Assignments

- All Exercises and Assignments will be submitted online in Canvas in html, Word, or pdf format. These reports are to be prepared using R Markdown in RStudio.
- Each student will need to install knitr package and its dependencies in order to create these reports.
- This format allows seamless integration of notes and textual material with R code and output, including graphics.
- Exercises: Edit the template provided in Canvas for the current lesson and "Knit" to html.
- Alternately: Create a markdown file (File > New File > R Markdown), edit the file, then click "Knit" to compile the report. The markdown file is for example, "myfile.Rmd" and the report file is for example "myfile.html". You submit the html report (not the Rmd source file) in Canvas.

Grading

Each assignment, exercise, and project is assigned a point value, and the grade recorded is the number of points earned. The course grade will be determined on the overall percentage score: 90% A, 80% B, 70% C, 60% D, 50% or less F.

- All grades will be posted in Canvas.
- Set your Canvas notifications to be notified immediately for any new or updated assignments, and check Canvas regularly for any announcements or discussions.
- Late Assignment Policy: Unexcused late work will be assessed a penalty. The first instance is -10%. The second instance is -20%. The third and subsequent instances are penalized 50%.
- Class Exercises will be due by the end of the day (any time before midnight) of the class meeting.

Classroom Policies:

- During class, any personal devices are only to be used for MATH 3440 and not for personal web surfing or other courses. This includes tablets, laptops, cell phones, smart watches, etc.
- Acceptable uses of devices during class are primarily interactively participating in the lesson within the RStudio IDE, or looking at MATH 3440 materials on Canvas.
- Cell phones are to be kept out of sight and not used during class. In case there is an urgent message expected, put your phone/notification on vibrate and please step out of the room in order to handle it. Texting or other types of messaging during class is not permitted.

- Laptops borrowed from the cart in the classroom must be returned to the cart before leaving the classroom.

General Information and Resources for Students

The Learning Commons

The **Learning Commons** provides “one-stop-shop” academic support within the Jerome Library in the areas of Academic Coaching, Supplemental Instruction, Writing Consultations, Math/Stats Tutoring, subject groups and individual assistance.

The Learning Commons is a collaborative environment designed to foster independent learning to meet the needs of any student in any course at any time in the learning process. For more information, or to make an appointment: tlc@bgsu.edu ; 419-372-2823; www.bgsu.edu/learning-commons.html .

University Libraries

The University Libraries supports the teaching, learning and research mission of BGSU by advancing scholarship and creativity through collections and user-centered services that connect faculty and students to high quality information resources. For more information, to reserve a study space or to make an appointment: <http://www.bgsu.edu/library.html> ;<http://www.bgsu.edu/library/ask-us.html> ; 419-372-6943; libhelp@bgsu.edu.

Academic Honesty Policy/Codes of Conduct

The instructor and students in this course will adhere to the University’s general Codes of Conduct defined in the BGSU Student Handbook. The Code of Academic Conduct (Academic Honesty Policy) requires that students do not engage in academic dishonesty. For details, refer to the BGSU Codes of Conduct site at <https://www.bgsu.edu/student-handbook/code-of-conduct.html>.

The instructor and students will adhere to the general Code of Academic Conduct as outlined of the [BGSU Student Handbook](#). Specifically, students will not cheat, fabricate, plagiarize or facilitate academic dishonesty. Students who passively engage in cheating (i.e. allowing others to cheat off of them) may receive the same consequences as the person copying. In group work, if your partner or teammates do all the work on an assignment, you should not be listed as a contributor and should receive no credit for that work. If you allow an assignment to be submitted listing you as a contributor, but you did not contribute, this is equivalent to plagiarism.

Classroom Expectations/Inclusion

Students are expected to display tolerance and respect in all communication. Comments and language should be respectful and appropriate for a college community. All comments should also follow acceptable grammar and spelling.

Disability Services

If you have a disability that I should be aware of, please notify me so that I can make arrangements to accommodate your learning needs. To get more information about your rights, contact the Office of Disability Services for Students located in 38 College Park, 419-372-8495. (<http://www.bgsu.edu/disability-services.html>)

Religious Holidays

It is the policy of the University to make every reasonable effort to allow students to observe their religious holidays without academic penalty. In such cases, it is the obligation of the student to

provide the instructor with reasonable notice of the dates of religious holidays on which he or she will be absent. Absence from classes or examinations for religious reasons does not relieve the student of responsibility for completing required work missed. Following the necessary notification, the student should consult with the instructor to determine what appropriate alternative opportunity will be provided, allowing the student to fully complete his or her academic responsibilities. (As stated in The Academic Charter, B-II.G-4.b at:<http://www.bgsu.edu/downloads/file919.pdf>.)

Technology Support

Provides a central point of contact for faculty, staff and students for questions, problem reports, service requests and inquiries for University computer systems and communications technologies at BGSU. Email: tsc@bgsu.edu Phone: (419) 372-0999.

Veterans

BGSU educators recognize student veterans' rights when entering and exiting the university system. If you are a student veteran, please communicate with your instructor so reasonable accommodations can be made for absence when drilling or being called to active duty. See (<http://www.bgsu.edu/veteran/>) for more information.