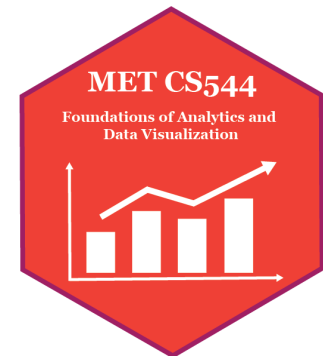


Foundations of Analytics and Data Visualization

Spring2024 MET CS544 A2 (Tuesdays 18:00-20:45 ET)
Course Format (On Campus: CAS B20)



Instructor Name: Hong Pan, Ph.D., Professor Pan (He/Him/His)

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URL: <https://www.bu.edu/csmet/profile/hong-pan/>

TA: TBD | **Email:** TBD

Student Hours: Instructor: Tue 17:30-18:00, 20:45-21:15 ET in CAS B20 in person

Course Description

The goal of this course is to provide students with the mathematical and practical background required in the field of data analytics. Probability and statistics concepts will be reviewed as well as the R tool for statistical computing and graphics. Different types of data are investigated along with data summarization techniques and plotting. Data populations using discrete, continuous, and multivariate distributions are explored. Errors during measurements and computations are analyzed in the course. Confidence intervals and hypothesis testing topics are also examined. The concepts covered in the course are demonstrated, using R.

Laboratory Course.

Prereq: MET CS546 and (MET CS520 or MET CS521), or equivalent knowledge, or instructor's consent.

Course Objectives/Outcomes:

By completion of the course, you will:

- Be able to understand the fundamentals of study designs, use graphical and other means to explore data, build and assess basic statistical models, employ a variety of formal inference procedures, and draw appropriate scope of conclusions from the analysis.
- Be able to write clearly, speak fluently, and construct effective visual displays and compelling written summaries, to communicate statistical findings and results.

Books and Resources

Required Textbook: Intro Stats 6th Edition by Richard D. De Veaux, Paul F. Velleman, David E. Bock, Pearson, 2021, ISBN: 9780136806868. The hard copy - rental only for \$80.99, and E books - to purchase for \$74.99 and to rent for 120 days for \$39.96. (Barnes & Noble at BU (Store 480), 910 Commonwealth Ave, Boston, MA 02215. Phone: 617-415-9160. URL: bu.bncollege.com)

Recommended Resources:

Spring2024 MET CS544 A2

- **Primers:** Please use [this super useful arithmetic review](#) to gain confidence in basic arithmetic operations.
- **R and RStudio:** [Installation Instructions and Free MET Virtual Lab](#) | [R package mosaic cheatsheet](#) and [Student Guide](#)
- **Supporting Textbook Materials:** <https://nhorton.people.amherst.edu/is5/index.html> , <https://openstax.org/details/books/introductory-statistics> , and Learning Statistics with R <https://learningstatisticswithr.com/> , Python Edition of Learning Statistics with R <https://ethanweed.github.io/pythonbook/landingpage.html>

Recommended Reference Books:

- **Mathematical Statistics with Applications**, 7th Edition, by D. Wackerly, W. Mendenhall, and R. Schaeffer, Cengage, 2008. ISBN-13 : 978-0495110811.
- **Introduction to Probability and Statistics Using R**, by G. Jay Kerns, 2010. ISBN-13: 978-0-557-24979-4. <https://github.com/gjkerns/IPSUR/blob/master/IPSUR.pdf>
- Teetor, P. (2019). **R cookbook**. Sebastopol, CA: O'Reilly. ISBN -13: 978-1492040682. The book has been made available online at <https://rc2e.com> and the code at <https://github.com/CerebralMastication/R-Cookbook>
- Chang, W. (2021). **R graphics cookbook**. Sebastopol, CA: O'Reilly. ISBN 9781491978573. The book has been made available online at <https://r-graphics.org> and the code at <https://github.com/wch/rgcookbook>
- Golemund, G. **Hands-On Programming with R**. <https://rstudio-education.github.io/hopr/>
- Wickham, H. and Golemund, G.. **R for Data Science**. <https://r4ds.had.co.nz/>
- For learning R: please utilize interactive learning tool **swirl** at <https://swirlstats.com/> and progress with at least one submodule (~15 minutes) per day.

Courseware

- **Blackboard** at <https://learn.bu.edu/>
- **R and RStudio:** [Installation Instructions and Free MET Virtual Lab](#) | [R package mosaic cheatsheet](#) and [Student Guide](#). You will do all of your analysis with the open source (and free!) programming language R. You will use RStudio as the main program to access R. Think of R as an engine and RStudio as a car dashboard — R handles all the calculations and produces the actual statistics and graphical output, while RStudio provides a nice interface for running R code.

Class Policies

- **Attendance & Absences** – This is an on-campus class. Class attendance is **mandatory** and will be recorded, and punctuality is expected. Statistics can be a challenging course at times and attending class is essential for your success in this course. If you have to miss a class, please email me as soon as possible.
- **Reading Assignments** are specified in the Course Schedule, and it is recommended to use the textbook odd-number exercise questions (with answers provided in Appendix A)

to help check your understanding in advance, and help form quality questions to be asked and discussed during class meeting time.

- **Homework assignments** will be posted, on Assignment Day specified in the Course Schedule, on Blackboard. You should submit your homework assignments via Gradescope. If you need an extension due to illness, email me BEFORE the homework due date. The homeworks is meant for you to practice solving problems. **Do not search for homework solutions online.**
- **Late Policy:** The assignment due dates are created intentionally to help you manage time effectively, and for you to receive timely formative feedback to facilitate learning. It is expected that you are turning in your assignments by the due dates. Any late assignments are not guaranteed to receive timely feedback. **Assignments more than a week late without an official accommodation will result in a 0.**
- **Academic Conduct Code** – Cheating and plagiarism will not be tolerated in any Metropolitan College course. They will result in no credit for the assignment or examination and may lead to disciplinary actions. Please take the time to review the Student Academic Conduct Code:
http://www.bu.edu/met/metropolitan_college_people/student/resources/conduct/code.html. This should not be understood as a discouragement for discussing the material or your particular approach to a problem with other students in the class. On the contrary – you should share your thoughts, questions and solutions. Naturally, if you choose to work in a group, you will be expected to come up with more than one and highly original solutions rather than the same mistakes.

Grading Criteria

- **Exams:** There will be 3 in-class 1-hour midterm exams as well as a cumulative 2-hour final exam during the semester, and the *lowest midterm exam score* may be replaced by the *final exam score* (if the final exam score is higher). All exams will be preceded with review / practice exam sessions.
 - Exam 1 on 02/20 [10%]: Chapters 1-8.5
 - Exam 2 on 03/26 [10%]: Chapters 1-13
 - Exam 3 on 04/23 [10%]: Chapters 1-20
 - Final Exam 05/07 [25%]: Cumulative (Chapters 1-20)
- **Class Activities & Participation:** [10%]: Students will be given class assignments to work on. To receive full credit, students will need to be present in class, actively participating, and turn in the assignment at the end of the class period. **In-person class Exit Ticket activity will be submitted at the end of each class meeting.** Note: Students may make up the class activity ONLY if they have an accommodation through the Office of Disability & Access Services or missed due to religious beliefs (such as for observation of a religious holiday). *The lowest 3 scores will be dropped.*
- **Homework Assignments** [25%]: There will be 5 practice and homework problem sets incorporating both textbook problems and R questions, covering material in the

corresponding module. Due on the dates specified in the Course Schedule at the beginning of class meeting time. **The lowest score will be dropped.**

- **Reading Quizzes [10%]:** 9 online quizzes will be weekly at the beginning of class meetings (except for the dates of Exams) to check that you have completed your readings from the textbook and keeping up with the material. **No make-up quizzes, and the lowest 2 scores will be dropped.**
- **Reflective Journal:** Keep a personal journal of critical reflections: To reflect on one’s own individual journey throughout the learning process, to log important moments of growth and key learning during this process, to reflect on personal development or change in relation to learning, including lessons learned about self, the way of learning, and any accomplishments or challenges. **A link to the live google doc of your reflective journal shall be included at the end of each Assignment submission.**

Class Meetings, Lectures & Assignments

Week	January 2024							Week	February 2024							Week	March 2024							Week	April 2024							Week	May 2024													
	Su	Mo	Tu	We	Th	Fr	Sa		Su	Mo	Tu	We	Th	Fr	Sa		Su	Mo	Tu	We	Th	Fr	Sa		Su	Mo	Tu	We	Th	Fr	Sa		Su	Mo	Tu	We	Th	Fr	Sa							
			1	2	3	4	5	3				1	2	3	7					1	2	12		1	2	3	4	5	6	2	16															
	7	8	9	10	11	12	13	4	4	5	6	7	8	9	10	6	8	3	4	5	6	7	8	9	5	13	7	8	9	10	11	12	13	9	17	5	6	7	8	9	10	11				
1	14	15	16	17	18	19	20	5	11	12	13	14	15	16	17	13	9	10	11	12	13	14	15	16	14	14	15	16	17	18	19	20	16		12	13	14	15	16	17	18					
2	21	22	23	24	25	26	27	6	18	19	20	21	22	23	24	20	10	17	18	19	20	21	22	23	23	15	21	22	23	24	25	26	27	23		19	20	21	22	23	24	25				
3	28	29	30	31				7	25	26	27	28	29			27	11	24	25	26	27	28	29	30	26	16	28	29	30							26	27	28	29	30	31					
	X								X							X								X							X															
	X								X							X							X							X																

Grading Scale for this Course:

Final grades will be assigned according to the following ranges:

A 93.50-100%	B+ 86.50-89.49%	C+ 76.50-79.49%	D+ 66.50-69.49%	F <60%
A- 89.50-93.49%	B 83.50-86.49%	C 73.50-76.49%	D 63.50-66.49%	
	B- 79.50-83.49%	C- 69.50-73.49%	D- 60.00-63.49%	

Our Classroom Community

At Boston University, faculty and students work together to build a respectful, inclusive learning environment. Our aim is to create and maintain a positive and supportive classroom atmosphere where the diversity, backgrounds, and perspectives of all members are valued and respected. The following guidelines will help us work toward this goal and clarify expectations for engagement in this course and with each other.

1. **Cooperative Learning:** While cooperative learning via group discussion is encouraged (and the final grades will not be curved, for the purpose of promoting peer learning), you should write your answers independently. Exam problems will often be similar in nature to assigned homework problems. Therefore you are personally responsible for knowing how to do each homework problem (even if you worked in a group on the homework). **So it is important that you understand how to solve the homework problems!**
2. **During Class:** No cell phones may be on during class. Laptop computers must be put away during class time, except for class activity time. Tablets (e.g., iPads) may be used

only for note-taking, only if flat on the desk like a traditional notebook. Students may not use tablets to look at web pages, play games, etc. **Pencil-and-Paper note taking is encouraged, and Cornell Note Taking Method is recommended.**

3. **Communication:** The best way to contact me is through email. Please give me 48 hours to respond. After that time, please follow up if you have not heard from me in case your email was lost in the shuffle.

Statement of Support

- Take care of yourself. Do your best to maintain a healthy lifestyle this semester by eating well, exercising, avoiding substance abuse, getting enough sleep and taking some time to relax. This will help you achieve your goals and cope with stress.
- All of us benefit from support during times of struggle. There are many helpful resources available on campus and an important part of the college experience is learning how to ask for help. Asking for support sooner rather than later is almost always helpful.
- If you or anyone you know experiences any academic stress, difficult life events, or feelings like anxiety or depression, we strongly encourage you to seek support.

Tips for Success:

1. **Three Simple Rules for Success** (that can benefit anyone who wants to be better in life):
 - a. **Know the text:** Complete the reading assignments before class meeting time
 - b. **Have a head full of ideas:** Bring questions to the classroom & willing to participate
 - c. **Show up on time:** Coming in a few minutes early liberates you, allowing you time to get comfortable and composed before you need to be at your very best
2. **Learning statistics by doing** statistics:
 - a. **Conceptual understanding** over memorizing
 - b. **Experimenting** over being perfect
 - c. **Process** over product
3. **Learning statistics is like learning a new language: Practice makes perfect!**
4. **Time** commitment and management (**at least 9 hours per week outside of class**) and **practice regularly (at least 15 minutes per day** will make a big difference within the short period of a semester).
5. ***"The secret of getting ahead is getting started." – Mark Twain***

Syllabus Statement

This syllabus is not a contract. The instructor reserves the right to alter course requirements and/or assignments based on new materials, class discussions, or other legitimate pedagogical objectives.