Biostatistics (Biol/Math 218)

Fall 2024

Monday, 2:30 – 5:21 pm, Carson 615

Professor: Dr. Matthew Lundquist

Office: Carson 603

Email: mlundquist@mmm.edu

Office hours: By appointment

Required materials

- Free GitHub account (For access to Python.GriffyStats.com)
- Working laptop or tablet with keyboard with an internet connection
  - Windows, Mac, Linux, ChromeOS, PadOS, iOS, Android all work!
  - Note: Laptops can also be provided for class sessions

Optional materials

Optional textbook(s):

- Whitlock & Schluter (2019). The analysis of biological data (3rd edition). W. H. Freeman. ISBN: 9781319226299

- OpenStax Introductory Statistics is available, but is much more limited than Whitlock book

Course description

Much of what we know about the biological world is based on rigorous collection and analysis of data. By the end of this course, students will be able to:

- Organize, analyze, and present biological data.
- Work with real-world data from ecology, medicine, and other fields in the biological sciences.
- Choose and perform proper statistical tests for a variety of data and interpret their results.
- Use Python, a high-level programming language and statistical analysis tool, to perform basic statistical analyses and modeling.

Course expectations

A student's success in this class depends on their input and effort. Biostatistics is a large and complex subject, and all the material cannot be adequately covered just during the weekly class meetings. There will be no traditional lectures in this course. Instead, class work each week will be diving into topics in biostatistics and working with real-world data.

Grading

1. Statistics portfolio (300 points): In conjunction with the assigned readings and in-class activities, students will be required to compile an electronic portfolio of their statistical work. This includes the data, methodology with justification, statistical and graphical outputs, computer code, and reflection for each of the statistical tests that they learn in class. The point of the portfolio is for students to create a reference manual for themselves that they can use in the future.

   Professor Lundquist will provide a prompt for each portfolio section on GitHub. Portions of the portfolio will be submitted as .ipynb Jupyter Notebook files on Brightspace by 11:59 pm on the day they are due. See tentative calendar for particular due dates. Students may work collaboratively on portfolios, but all work must be submitted in their own words (this includes the use of generative AI, e.g., ChatGPT)

   Portfolios will be graded on completeness, accuracy, and lack of errors. All errors in code (bugs) must be fixed before final submission to receive full credit. **Debugging is a great use of office hours!**

2. Pop quizzes (200 points): Several short "pop" quizzes based on the most recent content will be assigned during class time. Dr. Lundquist will provide a problem, and students will have to solve it in a limited time frame. Answers, including work, will be submitted immediately once the time frame is over.

3. Independent statistical project (300 points): Towards the end of the semester, students will be given a choice of data to analyze independently. Students will prepare a short (5-7 page) report of their findings, including the statistical analyses, graphical outputs, and interpretation. Students will also present their findings to the class the last week of class. Final reports will be submitted as a .ipynb Jupyter Notebook file.

Note: Generative AI (e.g., ChatGPT) is a great resource for checking your code, however, using generative AI to produce your code (for portfolios, pop quizzes, or independent studies) will be considered plagiarism and result in a low score or a score of zero, depending on the level of plagiarism. To avoid this all code/statistical techniques must be in the same format presented in the course textbook. I will not consider that plagiarism. Any other techniques/formats will not be accepted.

It is OK to copy and paste and then modify code from the textbook, it is not OK to copy and paste from generative AI.

4. Participation (200 points): Attending is key to success in this class. Also, statistics are not grasped by everyone at the same pace and students are highly encouraged to work together and help each other out. However, all students must turn in their own work. Participation will be determined according to attendance and quality of handed-in in-class assignments and activities. **If you do not attend class, you cannot gain participation points on graded assignments.**

Total = 1000

Grade Equivalents

Grade	Range	Percentage (x/10)
A	≥ 930	93% - 100%
A-	895 - 929	89.5% - 92.9%
B+	860 - 894	86% - 89.4%
B	825 - 859	82.5% - 85.9%
B-	790 - 824	79% - 82.4%
C+	755 - 789	75.5% - 78.9%
C	720 - 754	72% - 74.9%
C-	685 - 719	68.5% - 71.9%
D	600 - 684	60% - 67.9%
F	< 600	< 60%

Important policies

Recording of Classes

Please be aware that audio recording or photographing online or in-person classes is strictly prohibited unless a student has received explicit permission from the instructor. An exception is made for students who have registered with the Office of Disability Services and have been granted prior approval to receive audio recordings, which can be provided by the course instructor. Students with approval to receive recordings must sign a contract agreeing to keep all recordings confidential, not share or disseminate them in any form, and to destroy all recordings after completing the course. Instructors are also required to inform students if they will be recording a class session.

Attendance

To be successful in this class, you must attend all class meetings and all homework, and in-class assignments must be handed in by their assigned times.

Students must notify Dr. Lundquist via email for any missed classes to make sure that they do not fall behind and that they have access to pop quizzes. Consistently missing class can negatively impact participation grades.

Brightspace

This class will make limited use of Brightspace, instead using a dedicated course website: https://python.griffystats.com as well as tools from GitHub. Brightspace will be used for some assignment submissions and a basic grade book will be kept.

Important: the grading capabilities on Brightspace are limited and Dr. Lundquist holds the official grade book. Dr. Lundquist will be happy to address any questions about grades or status in the class via email or during office hours. Do not rely on Brightspace for continuously updated grades.

Email

Dr. Lundquist will be available by email if you have concerns or questions about the class. However, please understand that since he teaches multiple classes, he may take up to 24 hrs to respond. If you email during the weekends, they might not be responded to until the following Monday.

Accommodations

Students with disabilities (learning, physical or psychological) who require reasonable accommodations or academic adjustments for a course must be registered with the Office of Disability Services or enrolled in the Academic Access Program. With students' permission, faculty members are notified each semester by CONFIDENTIAL email that a student with documented disabilities is enrolled in their class and is eligible for accommodations. If a student has questions regarding the Office of Disability Services or accommodations, please email disabilityservices@mmm.edu. This office is located in Nugent 353. Please be aware that audio recording class lectures and discussions is an accommodation some students may use when it is approved through the Office of Disability Services. If approved, the student signs a contract agreeing to keep all recordings confidential, not share them with others, and to destroy all recordings after completing the course.

Academic honesty

MMC fosters an academic community where students and faculty work together to create a learning experience that imparts knowledge and forms character. To achieve this, the College requires all members of the community to adhere to the policy of Academic Honesty that can be found in the Student Handbook, the College Catalogue and on the College website (bit.ly/mmc-ah)

ChatGPT and other generative AI

Recently, artificial intelligence companies like OpenAI have introduced generative AI programs that take simple prompts and generate new content including essays, images, audio, and programming code. While this technology is extremely exciting and useful, students in particular should be cautious when utilizing these tools.

For example, ChatGPT is a large language model trained by OpenAI that can generate human-like text. It can be used to check biostatistics code and concepts by providing explanations and generating examples. However, it is important to note that ChatGPT is a machine learning model and may not always provide accurate or appropriate information. It is recommended to verify any information provided by ChatGPT with additional sources and to consult with your professor with complex or critical issues. Additionally, it is important to remember that ChatGPT and any other AI technology is only as good as the data it was trained on, so it may not be able to answer questions or provide information on newer developments or specialized topics.

If students have any concerns related to using ChatGPT or any other AI technology for their assignments, they should bring them to the attention of their instructor.

Inclusivity statement

Marymount Manhattan College respects and honors the dignity and value of every human being. We aspire to be a diverse, equitable, and inclusive community in which people with different identities – whether based on race, color, class, gender identity, age, sexual orientation, religion, ethnic or national origin, political viewpoint, disability, physical appearance, or additional identities – are valued and respected, and where differences in intellectual interest and personal perspective are explored and embraced as central to the College's educational mission.

We recognize the regrettable role that higher education has played in reinforcing inequality in our society, and we believe that our College has a special responsibility to prevent those same inequalities from being perpetuated in our campus community. As a College we hold in common a set of core values and beliefs – in the open and free exchange of ideas; in celebrating those whose perspectives and experiences may differ from our own; and in advancing the cause of social justice. We are dedicated to creating a learning environment free from bias and harassment, one that maximizes each person's capacity to learn, work, and make meaningful contributions both here and beyond.

Center for Academic Support and Tutoring

The Center for Academic Support and Tutoring, CAST, offers students of all grade levels free, one-on-one tutoring support in a variety of academic subjects, such as, Business, Math, Philosophy, Biology, Writing, Languages and many more. We are staffed primarily with professional tutors who hold advanced degrees and teaching experience in their discipline. CAST tutors are friendly and welcoming, and they aim to empower students with skills that will help them grow confident in their abilities and thrive academically. Appointments can be made online through the MMC website by clicking, 1.) Current Students, 2.) Tutoring Scheduler under Study & Register, or, in person at Nugent 451. Walk-ins are also welcome.

Policies Against Discrimination and Harassment

Marymount Manhattan College strives to create an academic environment that excludes all types of harassment and discrimination. We each have a responsibility to uphold these values. If you or someone you know has experienced bias, discrimination, harassment, or sexual misconduct, please use this form to file a report or email the Chief Equity, Diversity and Inclusion Officer or the Title IX Coordinator.

Please be aware that all MMC staff and faculty members are "responsible employees", which means that if you share a situation involving an incident of bias, discrimination, harassment, or sexual misconduct, they must share that information with the Chief Equity, Diversity and Inclusion Officer and Title IX Coordinator. Although faculty and staff are obligated to share this information, you are in control of how to proceed with a reported incident, including whether or not you wish to pursue a formal complaint. Our goal is to make sure you are aware of the range of options available to you and have access to the resources you need.

If you wish to speak to a confidential resource who is not obligated to report information shared, you can contact any of the following on-campus resources:

Counseling and Wellness Center

212-774-0700

cwc@mmm.edu

Dow Zanghi Health Center

212-759-5870

231 E. 55th St. (in the 55th St. Residence Hall)

Tentative schedule

Date	Topic	Portfolios
09/09-09/16	Introducing biostatistics and working with data	
09/23-09/30	Summarizing (with uncertainty) and visualizing data	Portfolio 1 due 10/07
10/07	Probability	
10/21	Experimental design and hypothesis testing	Portfolio 2 due 10/28
10/28-11/04	Binomial and χ^2 tests for independence and goodness-of-fit (case studies in genetics)	Portfolio 3 due 11/11
11/11-11/18	T-test suite and non-parametric alternatives (case studies in ecology)	Portfolio 4 due 11/25
11/25-12/2	Analysis of variance and non-parametric alternatives (case studies in conservation biology)	Portfolio 5 due 12/09
12/09	Predictive models	
12/16	Final project presentations	