

# DA/MATH 220: Applied Statistics

Fall 2020, hybrid class

## Instructor Information

Instructor	Email	Office Location & Hours
Zhe Wang (she/her)	<a href="mailto:wangz@denison.edu">wangz@denison.edu</a>	Burton Morgan 410, Scan the QR code for Zoom appointments Tue 9:00-10:30am, 1:30-3:00pm

## Teaching Assistant Information

Instructor	Email	Office Location & Hours
Ward Anderson(he/his)	anders_w2@denison.edu	TBD

## Course When and Where

Primary: Zoom

- Meeting ID: <https://denison.zoom.us/j/92374017367>
- Passcode: 037841

Secondary: Mulberry Gallery Space (TBD)

Monday / Wednesday/ Friday, 11:30am -12:20pm

Tuesday Discussion, 11:30am -12:20pm



## General Information

### Class Model & Weekly Rhythm

SUN	MON	TUE	WED	THU	FRI	SAT
Look for new videos and assignments posted for the upcoming week	Technical lectures on Zoom	Discussion on Zoom or in Mulberry Gallery Space (Rotation)	Technical lecture on Zoom		Technical lectures on Zoom	

This course will be given **mostly online**, with occasionally on-campus meeting for trouble shooting, review, and discussion.

Technical lectures: Please check Notebowl at least 5 minutes before the class to find the Zoom link. Classes will be live streamed to Zoom and recorded for future viewing. I ask that you keep class recordings limited to personal and classroom use. Please do not share, modify, or post classroom recordings, screenshots, or content outside of Notebowl or our classroom Google Drive account without explicit permission from the instructor, as this is a privacy issue for your peers. **Attendance is not mandatory for remote students, but you have to talk to me in the first week.**

Discussion: Two of you will be assigned to lead the discussion on some cool topics every week. I'll post the list of topics in the first week. You need to find your partner and choose your topics (first come first served!).

## Course Description

Statistics is the science of reasoning from data. This course will introduce the fundamental concepts and methods of statistics, including calculus-based probability. Topics include experimental design, data collection, and the scopes of conclusion, a robust study of probability models and their application to statistical inference, hypothesis testing, and regression analysis.

Class will typically consist of short introductions and hands-on computing exercises. The course will be taught using R, RStudio, and RMarkdown, but the concepts learned will frequently apply across multiple programming languages and data management systems.

## Weekly Schedule

Weekly schedule will be updated [here](#).

## Learning Outcomes

At the end of the course, you should be able to:

- Apply randomization and parametric statistical tests to examine the significance of observed phenomena
- Create data visualizations and compute fundamental statistical quantities
- Describe randomness with random variables and different discrete and continuous distributions
- Predict future trends from historical data
- Communicate findings to a diverse, non-technical audience
- Interpret statistics with a critical eye to how they can be manipulated

## Required Course Materials

- *Practicing Statistics*, by Kuiper and Sklar
- *An Introduction to Statistical Learning*, by Gareth James, Daniela Witten, Trevor Hastie and Robert Tibshirani
  - Free online(<http://faculty.marshall.usc.edu/gareth-james/ISL/index.html>)
- Additional selected readings will be made available via NoteBowl or Google Drive

Any additional required course materials will be drawn from (legally!) free, online sources. You may find them posted on the Notebowl forum for the course.

## Software

All projects in this course will be scripted and analyzed using **R**, an open source data analysis language and environment. Specifically, we will be using **RStudio** as our programming environment. No previous experience with R, statistical software packages, or computer programming is required.



PLEASE! Install

**R**, (<https://www.r-project.org>)

**RStudio**, (<https://rstudio.com>)

**and RMarkdown** (<https://rmarkdown.rstudio.com>)

in the first week. Feel free to contact me or Ward for help if you have any installation issues.

Can't handle it? No problem! R can also be accessed via the browser at [r.denison.edu](http://r.denison.edu).

## Assignments and Grading

Component	percent of total
<b>Oral Presentation</b> To prepare for weekly class discussions, each student will be assigned a presentation on a rotating schedule.	5%
<b>Code Glossary</b> Complete and update your own code glossary.	10%
<b>Homework</b> Homework problem sets will be assigned on a weekly basis. You are allowed to work in groups, however, every student needs to submit individually and write up the solution in their own words. Problem sets will test theory and small computational issues. Homework will be due by <b>11:59pm on Wednesday</b> . You may need to scan your handwritten work or generate a statistical report from RMarkdown (Please submit one pdf file!). No late homework will be accepted without an institute approved absence.	35%
<b>Midterm Exam</b> There will be one take home midterm exam. Please check the weekly schedule for updates.	25%
<b>Final Project</b> You will work in groups of 2-3 on a final project that utilizes concepts and methods from the class.	25%

## Course Grading Scale

A+: 98%

B+: 88%

C+: 78%

D+: 68%

F: below 60

A: 92%

B: 82%

C: 72%

D: 62%

A-: 90%

B-: 80%

C-: 70%

D-: 60%

## Expectations for this class (that's you and me!)

### Preparation and Pacing

This class is a broad overview of the field of Data Analytics, and foundational skills in data and programming. We will cover a lot of information during the semester, and you will have many opportunities to practice these skills, discuss ethical and philosophical aspects of applied statistics with your peers, and collaborate on projects.

Some of you may be entering the classroom with more advanced prior knowledge of these topics, while others may be encountering these concepts for the first time. Group learning, coding, and discussion are key aspects of this course. This means that we all need to do our part to be prepared for each class, and to foster a positive and inquisitive learning environment.

In between classes you should:

- Review your notes from class
- Read relevant portions of your textbook or the online readings
- Refer to NoteBowl for updates to the syllabus, share or respond to posts in the class forum
- Leave yourself enough time to read and respond to weekly writing assignments
- DO NOT wait until the last minute to begin your final project
- Proofread your writing and coding assignments
- EMAIL your instructor with any questions. Ask lots of questions!

## Attendance Policy

Your presence in class is expected. You will not be directly graded on your class attendance or participation, but in order to succeed in this class, it is very important that you attend and participate each time we meet. Please let me know in advance if you will not be able to attend a class session.

If you become ill, have a religious holiday, mandatory athletics or performance event, or personal circumstances arise that make it necessary for you miss more than 1-2 classes in a row, please do not wait to contact me to work out an arrangement so that you do not fall too far behind. Remember, we are all in this together!

Again, attendance is not mandatory for remote students, but you have to discuss with me **in the first week**.

## Teamwork

In this class, we will frequently work together in pairs or larger teams to explore and solve puzzles, where statistical analytics skills can provide insight into interesting questions and approaches. I encourage you to approach team work with an open mind, and to be cognizant of how your actions and communication can either help everyone in the team learn, or create a negative environment that hinders learning. Team collaboration is an essential skill for data analysts, including the ability to work together with people you don't know, or don't get along with well. Each team member should contribute to both technical, and non-technical aspects of the project (for example, don't designate only one person as the "note-taker").

## Academic Honesty and Integrity

Academic honesty, the cornerstone of teaching and learning, lays the foundation for lifelong integrity. Academic dishonesty is intellectual theft. It includes, but is not limited to, providing or receiving assistance in a manner not authorized by the instructor in the creation of work to be submitted for evaluation. This standard applies to all work ranging from daily homework assignments to major exams. Students must clearly cite any sources consulted—not only for quoted phrases but also for ideas and information that are not common knowledge. Neither ignorance nor carelessness is an acceptable defense in cases of plagiarism. It is the student's responsibility to follow the appropriate format for citations. Students should ask their instructors for assistance in determining what sorts of materials and assistance are appropriate for assignments and for guidance in citing such materials clearly. *For further information about the Code of Academic Integrity, see <http://denison.edu/academics/curriculum/integrity>.*

## Names and Pronouns

Everyone has the right to be addressed as they feel most comfortable. It's hard to learn if you cringe every time I call on you or address you in communication. I will ask everyone at the beginning of the semester to tell me their preferred

name, pronunciation, and the pronouns they use. I will do my very best to get it right. Please do not feel the need to change your name or pronouns to “make it easy” for me, and please correct me if I get it wrong! This policy goes for everyone -- use the names and pronouns dictated by the person to whom they belong. Also, our personal growth does not always align with the semester system: If your name or pronoun changes part way through the class, please send me an update!

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## **The Quantitative GE Requirement**

The goal of the quantitative reasoning requirement is to develop the skills of all students in the descriptive, analytical, and predictive aspects of quantitative reasoning. A course fulfilling this requirement must utilize numerical quantities and employ, as an integral and sustained part of the course, at least one of the following forms of quantitative reasoning.

- 1) the application of mathematical models to describe or predict the behavior of systems, and the design, construction, and interpretation of graphical representations of mathematical models.
  - 2) the utilization, numerical analysis, and interpretation of the significance and limitations of data to answer questions, test hypotheses, or solve problems, and the design, construction, and interpretation of graphical representations of numerical data.
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## **More important resources to help you in class and in your college journey**

### **Mental Health**

What we do in college is not easy, on many fronts. Students are challenged with feelings of depression, anxiety, and self harm at astonishingly high rates. Learning is hard, and you will likely be challenged in college in ways that you haven't experienced before. Learning while life is hard is even harder. Please take care of yourself. Drink water, eat well, and get more than seven hours of sleep. Have some hobbies, but don't feel the need to do \*everything\*. If you are feeling depressed, withdrawn, anxious, like an impostor, or you are having specific problems with friends, family, grief, culture shock, etc., please seek help. There are many resources on campus, and my door and email is always open.

The **Denison Health and Wellness Center** offers free and confidential counseling services: <https://denison.edu/campus/health/counseling-services>

The **Red Thread** program provides aid to participate in co-curricular experiences and in cases of unexpected financial emergency or need. This link can tell you more about it, and other funding resources:: <https://my.denison.edu/node/3369>

Denison has a **campus food pantry** if you need assistance. It is open to all Denison students 6-8 pm on Tuesdays in Higley 014 and you can email [kalinuskis@denison.edu](mailto:kalinuskis@denison.edu) if you have any questions.

### **Disability Accommodation and Resources**

Any student who feels they may need an accommodation based on the impact of a disability should contact me privately as soon as possible to discuss his or her specific needs. I rely on the Academic Resource Center (ARC) in 020 Higley to verify the need for reasonable accommodations based on the documentation on file in that office.

### **Denison Library**

I highly recommend that you make use of the Denison Library resources while navigating your final projects this semester. That includes not only primary literature, access to databases, and book references, but also your

friendly reference librarian, Yiming Guo. He can be reached anytime at [guoy@denison.edu](mailto:guoy@denison.edu) and is an excellent resource for finding information efficiently, or learning what you can access through Denison subscriptions that might not be freely available on the internet. The Denison Library homepage is <https://denison.edu/campus/library> and you can find the remote learning libguide at <https://libguides.denison.edu/Off-Campus-Access>.

## Writing Center

The Writing Center is a free resource available to all Denison students. Student writing consultants from many majors help writers one-on-one in all phases of the writing process - deciphering the assignment, discussing ideas, developing an argument, and finalizing a draft. Because proofreading is a final step in that process, you should leave plenty of time (at least a week) for getting your ideas right before expecting proofreading help. Consultants also can help writers with personal documents, like job and internship applications. Consultants welcome diversity and are prepared to work with multilingual writers. If needed, Consultants can refer a multilingual writer to Denison's Coordinator of Multilingual Learning for additional support. The Center is located on the fourth floor of Barney-Davis Hall; a satellite location is in the Learning Commons on the entrance level of the Library. Appointments between 4 pm and 9 pm, Sunday through Thursday, can be made for the Barney-Davis location on the on-line scheduler at the MyDenison Writing Center website; the library satellite location only is drop-in. Check the website on MyDenison for those hours.

## Multilingual Support

In addition to the academic support services available to all Denison students, students who use English as a second (or third, etc.) language, can meet with Denison's Interim Coordinator of Multilingual Learning, Kalynda Thayer. She offers a variety of support for L2 students, from consulting with you about your written work to helping you devise strategies for developing and effectively using your listening, speaking, reading, and writing skills in English. You can email her at [kalynda.thayer@denison.edu](mailto:kalynda.thayer@denison.edu) to schedule an appointment.

A special note about writing assignments: remember that the Writing Center is a valuable resource. Writing Center Consultants welcome diversity and are prepared to work with all students. If needed, Writing Center Consultants can refer you to Denison's Coordinator of Multilingual Learning for additional support with writing assignments.

## Reporting Sexual Assault

Essays, journals, and other coursework submitted for this class are generally considered confidential pursuant to the University's student record policies. However, students should be aware that University employees are required by University policy and Title IX guidance to report allegations of discrimination based on gender identity / expression, including sexual misconduct, sexual assault and suspected child abuse/neglect, occurring on campus and / or involving current students at Denison University when they become aware of possible incidents in the course of their employment, including via coursework or advising conversations. There are others on campus to whom you may speak in confidence, including counselors at the Whisler Center for Student Wellness, SHARE advocates, and clergy. More information on Title IX and University policy guidance on gender identity / expression bias and sexual misconduct / assault, including support resources, how to report, and prevention and education efforts, can be found at [denison.edu/titleix](https://denison.edu/titleix); students may also contact Steve Gauger, Campus Title IX Coordinator, in Doane Administration 001, by email at [gaugers@denison.edu](mailto:gaugers@denison.edu), or by phone at 740-587-8660.

## Cautions regarding copyright and licensing

Zoom recordings will be made from our class sessions to enable full participation for everyone. These recordings cannot be modified or shared outside the classroom space without explicit permission from the instructor. Sharing class recordings would not only be a breach of classroom intellectual property, but also a **privacy breach**

for your fellow classmates. All documents provided to you (i.e. syllabus, paper prompts, tests, etc...) are the property of the instructor or author. It is a violation of intellectual property to post these online (especially to websites promoting copying/cheating) or to provide them to students not in our class or in future classes. Your papers are your property, and while you can do with them as you wish, it may be a violation of academic integrity to make them available to others who might use them for plagiarism. Basically, keep course materials and your work to yourself except in the process of editing and peer review.

## **Inclusion and Diversity in Data Analytics**

This course is open to anyone interested in Data Analytics. It is my intent to make all students feel welcome and served in this course by addressing their learning needs. We all (including myself) are continuously learning about different lived experiences and in this course we will encounter anti-racist pedagogy and confront inequities in how data is collected and used. In this course, if you encounter anything said (intentionally or unintentionally) that made you feel uncomfortable, please talk to me about it. If your learning is impacted by your background, or any life event going outside of class, feel free to talk to me. Even if you choose not to share details, I would be happy to direct you to the right resources on campus.

## **Content Warning**

Datasets (and some readings) that are based on observations of humans, often contain a gender variable that is binary. Occurrence of such instances does not mean that I condone such binary. In this course, you may encounter datasets with variables that may trigger strong emotions. Some of these variables may include, but are not limited to addiction, sexual assault, racial targeting, suicide, medical conditions, and death. If you would like any specific warnings please talk to me so that I can plan accordingly.

