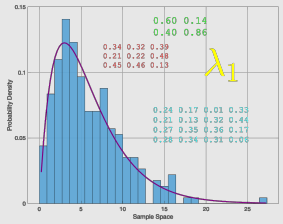
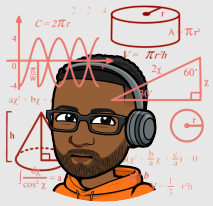


Probabilistic Models and Methods

Math H397

Instructor Info



Reginald L. McGee II, Ph.D.

Pronouns: He/Him/His

Student Hours: Mon. 1:30-3pm, Tues. 2:15-4pm, or by appt.

Hilles 209D

https://mcgeerb.sites.haverford.edu

rmcgee@haverford.edu

Course Info

Monday & Wednesday

11:30am-12:55pm

Hilles 12

Equity and Inclusion

You are all welcome and belong here. I will always work to make our classroom a safe place for everyone to contribute, learn, and grow no matter your identity, background, or circumstances. Please do not hesitate to reach out if I can do anything to improve the classroom climate. In addition, I expect our classroom to be a place where we respect one another and support each other's learning.

Overview

Math 397 will compare and contrast stochastic and deterministic versions of scenarios and algorithms that regularly arise in computational science. The scenarios will include simulating models, estimating model parameters using data, and analyzing models to gain insights on their predictive capacity. The course will begin with considering elements of probability, random variables, common distributions, and Markov chains then proceed to the aforementioned scenarios. The course will conclude by considering some contemporary topics in a journal club format.

Learning Objectives

- Demonstrate understanding of the core concepts of numerical analysis and statistical computing
- Demonstrate familiarity with using MATLAB or other computational tools to conduct analysis
- Demonstrate proficiency with calculus and linear algebra in applied contexts
- Exercise written and verbal communication of mathematics
- Develop both independent and collaborative problem solving skills

Material

Recommended Texts

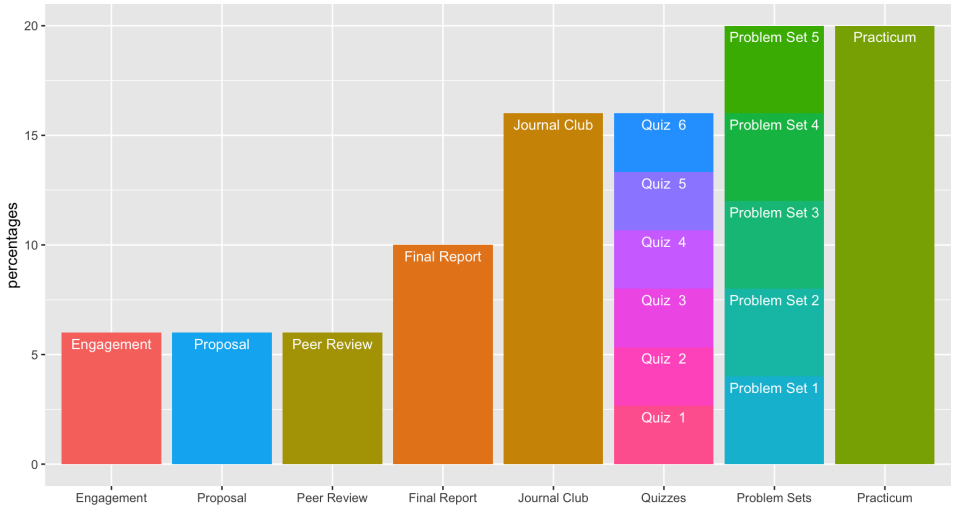
Ross, S. *Simulation (v. 6).* 2016.

https://shop.elsevier.com/books/simulation/ross/978-0-323-85738-3

Other

We will occasionally be using the *free* online homework package WebWork. These optional assignments can be accessed from the Moodle course page.

Grading scheme overview



Wellness

- If you feel sick, do not come to class.
- For the safety of everyone, if you ever have an active cough please wear a mask over your nose and mouth during class and/or student hours. You will be asked to leave if you are noncompliant.

Grading and assignment notes

Your final course percentage will be computed as follows:

Academic Engagement	6 %
Project Proposal	6 %
Peer Review	6 %
Final Report	10 %
Journal Club	16 %
Quizzes	16 %
Problem Sets	20 %
Practicum	20 %
Total	100 %

(i) The aggregate score on each assignment and summative assessment will receive a numerical score which will contribute to the appropriate percentage. At the end of the semester, total course percentages will be used to determine final grades. I do not use an absolute scale to determine letter grades.

(ii) Academic engagement includes effort observed throughout the course, contributing to a positive learning environment by asking questions and collaborating during in-class coding and problem solving, completing pre-class activities, attending student hours, participating in Moodle discussions, answering questions, etc. You should aim to be doing many of these activities “most of the time" or “all of the time" as opposed to “some of the time" or “none of the time."

(iii) Written problem sets consists of less routine problems, and are meant to challenge you to synthesize concepts and expose you to new aspects of the material. Written problems are generally quiz or exam level problems. Written problem sets will usually be due on Wednesdays at 5pm, your submission should be uploaded.

(iv) Quizzes are summative assessments consisting of less routine problems. There will be $\sim$6 quizzes on the syllabus. Quizzes cover material since the preceding quiz or hour exam. The lowest quiz will be dropped at the end of the semester.

(v) The practicum is a summative assessment where you will be asked to perform several modeling and analysis tasks. More so than getting a particular correct answer, the objective on the practicum is to provide evidence that support choices made during the tasks and to coherently explain choices that were made.

(vi) The project is the final product of the course and will be scaffolded over the semester with a proposal, drafts, reviews, and a final report. The project will require you to pick a model of interest, construct an analysis plan detailing which course methods you plan to apply, effectively present the results of the analysis, concisely summarize the results and discuss any limitations and possible extensions. More detailed rubrics will be provided in the coming weeks. The project can be completed in teams of up to two individuals. If the project is completed in a group, there will be a short peer evaluation and self reflection form to complete.

The due dates for the components of the project are as follows:

Project proposal	Fri. March 28th	5pm
Submit draft for peer feedback	Fri. April 11th	5pm
Return feedback to peers	Fri. April 18th	5pm
Final report due	Fri. May 23rd	12pm

(vii) For the journal club, we will consider different contemporary topics in applied mathematics that have a statistical/stochastic element to them. Research papers will be assigned for reading and different (groups of) individuals will be responsible for presenting figures from the papers. Presenters will be assessed on their understanding of the assigned figure as well the presentation itself. If not presenting on a given day/paper, students will be responsible for submitting pre-class questionnaires on the paper. More detailed rubrics will be provided in the coming weeks.

(viii) Submissions should be Portable Document Format (PDF) and the filename for the PDF document should be:
LASTNAME-FIRSTNAME-YEAR-COURSENAME-SECTION-ASSIGNMENTNAME
These filename guidelines are in part to build good submission habits for when you need to send documents for jobs, interviews, internships, etc.

NOTE: There is a 24-hour, no-questions-asked grace period for problem set submissions. Problem sets turned in during this grace period will be marked late for the course records, but there will not be any grade penalty.

NOTE: Out of class meetings for group assignments should be in public spaces on campus and not in any student’s dorm or residence.

When life happens

Life happens to all of us, and it is important to recognize each other's humanity. Moreover, it is important to emphasize that your health and well-being are the most important outcomes of this class. The grace period on the problem sets is an example of a support built-in to the course for exactly when life happens. In general, please be in touch if there is anything that prevents you from engaging in the course and/or completing an assignment or assessment. The more advance notice helps the amount of options that can be considered. If there is an ongoing situation in your life, please let me and your Class Dean know as soon as possible so that we can try to accommodate and make an optimal plan forward.

How to do well in this course

- Attend class, participate, and ask questions. Having questions means that you are processing the material, never hesitate to ask questions.
- Go over your lecture notes as soon after class as possible. Google Ebbinghaus forgetting curve for more on why.
- Start working on problem sets as soon as they are assigned.
- Visit office hours, even if you don't have questions it's good to simply discuss material.
- Read and work through the textbook and previous notes in preparation for class.
- Study topics iteratively and work towards developing a growth mindset.

Collaboration

Collaboration on problem sets is welcomed, but should be approached carefully. There is a fine balance between learning from working with your fellow students and finding your own way through the material. What you turn in for written problem sets should reflect your personal understanding of the problems, so you must write the solutions yourself without referring to notes from your collaborative work. If you find you are not able to do this, then that is likely a sign that you have not yet fully understood that particular problem and you should pause and seek advice from us or one of the other help resources. Please indicate on your assignment who your collaborators were.

So as to ensure productive collaborative work, you should not be working in groups larger than four people on any given problem at any given time. Two- or three-person groups are better than four. Large groups of people "working together" are not really working together. If at any time in the semester you want to be working in a group but do not have a group of students to work with, please let us know and we will help you find a working group. If at any time in the semester, you find yourself in a group of students in which people are not feeling respected, please let me know as well.

Note that you are not allowed to use materials aside from the text, materials from Moodle, reserves in the library, and, of course, class notes in this course. These materials have been carefully curated to help you learn. In particular, do not use resources from the internet without express permission. Please help us ensure that we can maintain an environment of trust and respect throughout the semester by working with integrity and coming by if you have any questions.

E-mail Policy

I will only respond to class-related emails from your "haverford.edu" address. In the subject line of your email, you helps to include the name or number of the course so that I know to respond in an appropriate timeframe. Please begin with a salutation and also identify yourself in your email, and do not send attachments without first discussing it with me. It is sufficient to send the attachment in a separate email after describing it in a prior email. Emails that do not follow basic email etiquette may be ignored.

Disclaimer

The schedule listed on the course calendar is tentative, and topics covered on a given day may change slightly depending on the pace set for the course. The following may be changed, but only in the event of an emergency such as school closure: due dates for homework, dates for exams, and topics covered on each exam. If this occurs, it will be announced as soon as possible electronically and in class. I reserve the right to correct typographical errors on this syllabus without comment.

Equal Access

ADS: We are committed to partnering with you on your academic and intellectual journey and recognize that you bring many strengths, perspectives and strategies as you navigate this journey. We encourage you to think proactively and strategically about leveraging these strengths, in partnership with the many resources on campus. These resources include CAPS (free and unlimited counseling is available), Office of Academic Resources, Writing Center, Student Diversity Equity and Access Team, Health Services, Professional Health Advocate, Religious and Spiritual Life, the GRASE Center, and the Advising Deans. At times you may experience challenges or stressors that impact your ability to fully engage intellectually. If the stressors are academic, we welcome the opportunity to discuss and address those stressors with you in order to find solutions together. If you are experiencing challenges or questions related to emotional health, finances, physical health, relationships, learning strategies or differences, or other related topics, we hope you will consider reaching out to the many resources here on campus. Additional information can be found at `https://www.haverford.edu/deans-office-student-life/offices-resources`.

Additionally, Haverford College is committed to creating a learning environment that meets the needs of its diverse student body and provides equitable access to students with disabilities. If you have (or think you may have) a disability related to mental health, chronic health, neurological state, and/or physical condition – please contact the Office of Access and Disability Services (ADS) at hc-ads@haverford.edu. It is never too late to request ADA accommodations – our bodies and circumstances are continuously changing. Please know that all inquiries and health-related information is handled in a sensitive and confidential manner.

Students who have already been approved to receive academic ADA accommodations and want to use these in this course should share their accommodation letter and make arrangements to meet with us as soon as possible to discuss how their accommodations will be implemented in this course. Please note that accommodations are not retroactive and require advance notice in order to successfully implement.

If, at any point in the semester, a disability or personal circumstances affect your learning in this course, please do not hesitate to reach out to us. We want to be sure you are aware of the full range of resources and options available to you.

It is a state law in Pennsylvania that individuals must be given advance notice that they may be recorded. Therefore, any student who has a disability-related need to audio record this class must first be approved for this ADA accommodation by Access and Disability Services and then must communicate approval to me. I will then make a general announcement to the class that audio recording may occur while respecting students' right to privacy by not identifying the individual(s).

Title IX: Haverford College is committed to fostering a safe and inclusive living and learning environment where all can feel secure and free from harassment. All forms of sexual misconduct, including sexual assault, sexual harassment, stalking, domestic violence, and dating violence are violations of Haverford's policies, whether they occur on or off campus. Haverford faculty are committed to helping to create a safe learning environment for all students and for the College community as a whole. If you have experienced any form of gender or sex-based discrimination, harassment, or violence, know that help and support are available. Staff members are trained to support students in navigating campus life, accessing health and counseling services, providing academic and housing accommodations, and more.

The College strongly encourages all students to report any incidents of sexual misconduct. Please be aware that all Haverford employees (other than those designated as confidential resources such as counselors, clergy, and healthcare providers) are required to report information about such discrimination and harassment to the Bi-College Title IX Coordinator: `https://www.haverford.edu/users/ktaylor4`

Information about the College's Sexual Misconduct policy, reporting options, and a list of campus and local resources can be found on the College's website: `https://www.haverford.edu/sexual-misconduct`