Stat401. Applied Probability and Statistics II

Francesco Gaffi

Spring 2024

General information

Instructor: Francesco Gaffi

Class time: Tue/Thu 12.30-1.45PM

Classroom: MATHB0421

Email: fgaffi@nd.edu (UMD email TBD)

Office: Kirwan Hall 4104

Office hours: Tue/Thu 2.15-3.15PM

Teaching assistant

TBD

Materials

The principal teaching material for the course will be the lecture notes, uploaded on Canvas at the end of every week.
Useful published references are:

(A) Probability and Statistics for Engineering and the Sciences, 9th edition, Jay L. Devore.

(B) Statistical Inference, 2nd edition, George Casella and Roger L. Berger

(C) A First Course in Probability, 9th edition, Sheldon M. Ross

(A) will be used to give direct references in the detailed schedule. The core of the course will tentatively cover Chapters 6 to 12 of (A), with some topics from Chapter 13 and 14.
(B) and (C) are meant for consultation about mathematical details of the topics covered.
Older editions of these texts can be used.

We will use the software **R** and its GUI **RStudio**. They can be downloaded at https://cloud.r-project.org and https://rstudio.com/products/rstudio/ respectively. R coding will be covered in class. Sample codes will be uploaded on Canvas. A useful published reference is

(D) R by Example, Jim Albert and Maria Rizzo

Topics

The scope of the course is to introduce classical statistical inference methods, with an attention to both their probabilistic foundations and their implementation.

The main topics will be:

1. Probability review: probability spaces, random variables, moments, notable distributions, joint and conditional distributions, concentration inequalities and limit theorems.

2. Statistics review: population and samples, descriptive statistics.

3. Point estimation: properties of an estimator, method of moments and maximum likelihood principle.

4. Interval estimation: mean, proportion and variance.

5. Hypothesis testing: the Neyman-Pearson paradigm, one-sample tests, two-sample tests, equivalence with interval estimation, goodness-of-fit and independence chi-squared tests for categorical variables.

6. Linear regression: simple linear model, parameter estimation and inference, prediction, multiple regression, output interpretation.

Prerequisite

The basic prerequisite for this course is Math131 or Math141 and Stat400. Some topics from Stat400 will be reviewed in the first classes.
Familiarity with R is useful but not necessary. Make sure to have R and RStudio installed on your computer.

Class format

Lectures will be in-person. I will be using the blackboard and projecting my laptop screen for R sessions.

Communication

Canvas Announcements will be the principal mean of communication with the class. For questions whose answer cannot be found in the syllabus or in the materials uploaded on Canvas during the course, or to give any feedback about the course, feel free to email me. Make use of the office hours for clarifications about content covered in class, homework assignments, and R coding.

Assessment

The final grade will be determined by:

* **Homework assignments (30%)**. The frequency and length of these assignments will vary according to the material covered in class. Some exercises may require the use of R. You will never have less than one week since the release of an assignment to upload your solution on Canvas.

* **Midterm exams ($\mathbf{30\% = 15\% + 15\%}$)**. There will be 2 in-class midterm exams on **March 14th** and **May 2nd**.

* **R project (15%)**. An R assignment will be released towards the end of the course, and it will include a summary of the implementations seen during the course. The submission deadline will be shortly after

the end of the course. The last week of class, after Midterm 2, will be devoted to general review for the final exam, but also to discussion of the R project, if needed.

* **Final exam (25%)**. There will be a cumulative final exam.

Notes

* Solutions of the homework assignments are to be uploaded on Canvas. You can scan your **handwritten** work, or upload a **typed** solution.

* **Respect the deadlines.** Homework assignments and projects are scheduled so that you can keep up with the material of the course. Respecting the deadlines is in the interest of your learning. Unjustified late submissions will not be graded.

* You are allowed to **collaborate** on the homework assignments and the R project, but each student needs to type/write/code and submit their own solution.

* You can view your midterm exams and discuss the grading during office hours after the release of the grades.

* A formula sheet and a calculator will be allowed during midterm and final exams.

* Make-up exams can be scheduled on a case-by-case basis.

Letter grading

Final grade cutoffs										
+	97	+	87	+	77	+	67			
A	94	B	84	C	74	D	64	F	<60	
-	90	-	80	-	70	-	60			

Honor code

The UMD Code of Academic Integrity is administered by the Student Honor Council. The Code sets standards for academic integrity. As a student you are responsible for upholding these standards for this course. It is very important for you to be aware of the consequences of cheating, fabrication, facilitation, and plagiarism. For more information on the Code of Academic Integrity or the Student Honor Council, please visit http://www.shc.umd.edu.

Special needs

The University of Maryland provides upon request appropriate academic accommodations for qualified students with special needs. Please make sure to inform me about the accommodations you qualify for, if any, with the appropriate documentation from the University of Maryland Accessibility and Disability Services. Please find more information about setting things up at https://ads.umd.edu/.

Feedback

Every effort will be made to provide a safe, fair, and intellectually stimulating environment in this class. There are multiple avenues to seek help in this course, and I encourage you to use them. Please feel free to reach out with suggestions and feedback that, in your opinion, may improve the learning experience in this course.