PROB 140

Probability for Data Science

Fall 2021

WEEK 1 STUDY GUIDE

The Big Picture

We begin the course with a formal mathematical framework for defining and combining probabilities.

- The basic rules of probability are the same as those for proportions. To find a probability, you have to figure out an appropriate combination of rules to use.
- Numerical calculations quickly get large. Even in this age of powerful computers, mathematical approximation is often important for computation and insight.
- One of the rules enables you to update probabilities in the light of new information. This is a fundamentally important skill in data science. Assumptions matter, for identifying the right methods to use as well as for interpreting results.

Week At a Glance

Thu 8/26	Fri 8/27
Instructor's Session	
	GSIs' Sessions
HW 1 (Due Mon 8/30)	
Lab 1A (Due Mon 8/30)	
Read/watch Chapter 1	Read/watch Chapter 2

Reading, Practice, and Live Sessions

Sections	Topic	Live Sessions: Prof. Sahai	Live Sessions: GSIs	Recommended Practice
1.1, 1.2	Probability as a function - 1.1 defines the domain - 1.2 shows how to find probabilities assuming equally likely outcomes	Thu 8/26 1.3-1-5 with an emphasis on the math more than the computation 2.1, 2.3, 2.5: The relation between axioms and rules; conditioning	Fri 8/27 - "Balls in boxes": how this helps with visualization in problems that look very different from each other - Exponential approximation - What is common to Ch 1 Ex 7, 4, 6, 8, and Ch 2 Ex 12	Chapter 1 2, 5, 8, 9
1.3, 1.4	An example of an exact calculation, using the product rule of counting - 1.3 has the general calculation - 1.4 has the numerical computation in a special case			
1.5	The first of many exponential approximations in the course			Chapter 2 1, 4, 5, 6, 13 If you have time, try 14. It's popular with quant interviewers.
2.1, 2.3	The axioms and basic rules - 2.1 is about addition, and hence also subtraction - 2.3 is about multiplication, and hence also division (crucial for conditional probabilities)			
2.5	Bayes' Rule: updating probabilities by conditioning probabilities by conditioning			
2.2, 2.4	Examples. Don't just read them – work them out			