PROB 140

Probability for Data Science

Fall 2022

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

Wed 8/24	Thu 8/25	Fri 8/26
	Lecture	Sections
	HW 1 (Due Mon 8/29)	
	Lab 1 (Due Tue 9/6)	
	Read Chapter 1 Skim 2.1, 2.3, 2.5	Read Chapter 2, especially the examples

Reading, Practice, and Class Meetings

Book	Topic	Lecture: Prof. A.	Sections: GSIs	Optional Additional Practice
1.1, 1.2	Probability as a function - 1.1 defines the domain - 1.2 shows how to find probabilities under the assumption of equally likely outcomes	Thursday 8/25 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	Friday 8/26 - "Balls in boxes": how this helps with visualization in numerous problems - Exponential approximation - Conditioning and Bayes: points to notice - Discussion will be based around Chapter 1 Ex 7 and 4 (yes, in that order), and Chapter 2 Ex 8.	Chapter 1 1, 2, 10
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, and a graph that inspires a search for an identifiable functional form			
1.5	The first of many exponential approximations in the course			Chapter 2 1, 5, 6 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 which is a way to calculate conditional probabilities			
2.5	Bayes' Rule: updating probabilities by conditioning			
2.2, 2.4	Examples. Don't just read them – work them out			