PROB 140

Probability for Data Science

Fall 2022

WEEK 5 STUDY GUIDE

The Big Picture

We start by finding probabilities and expectations by conditioning. The next topic is the examination of a random process indexed by time, defined in terms of conditional distributions.

- Conditioning is a great way of finding expectations, just as it is for finding probabilities.
- In many situations involving i.i.d. trials, there is a recursive structure that can be used to simplify calculations.
- A *stochastic process* is a random process indexed by time. A Markov chain is a stochastic process with a particular dependence structure that allows it to be used as a simple model in many settings.
- Markov chains run for a long time have very interesting and useful properties.

Week At a Glance

Mon 9/19	Tue 9/20	Wed 9/21	Thu 9/22	Fri 9/23
	Lecture	Sections: **QUIZ 2**	Lecture	Sections
HW 4 Due HW 5 (due Mon 9/26)				HW 5 party 3PM - 5PM
Lab 2B Due No lab this week.				
Skim Sec 9.1 and 9.2	Study for the quiz	Take a break, or skim Ch 10.1 if you want to	Work through Ch 9, 10	Work through Ch 9, 10

Reading, Practice, and Class Meetings

Book	Topic	Lectures: Prof. A.	Sections: GSIs	Optional Additional Practice
Ch 9	**Expectation by conditioning** - 9.1 is the old multiplication rule combined with recursion, to find probabilities quickly - 9.2 shows how to find expectation by conditioning, building on the familiar calculation of finding an overall average as a weighted average of group averages - 9.3 has examples in the context of i.i.d. Bernoulli trials	Tuesday 9/20 - Probabilities and expectation by conditioning and recursion	Wednesday 9/21 - **QUIZ 2** - Ch 9 Ex 4	All Chapter 9 Exercises not covered in sections. Some are clones of homework problems.
Ch 10	**Markov chains** - 10.1 introduces terminology, notation, and basics, along with a computational approach to the long run - 10.2 narrows down the type of chain we'll be studying, but even the narrowed-down group is pretty large - 10.3 takes a more theoretical approach to the long run - 10.4 has examples and applications	Thursday 9/22 - Introduction to Markov chains - Long run behavior	Friday 9/23 - Ch 9 Ex 2, 5 - Ch 11 Ex 1	None. There are no exercises in Ch 10. All the Markov Chains exercises are in Ch 11, at which point you'll have techniques that make some of the solutions easier.