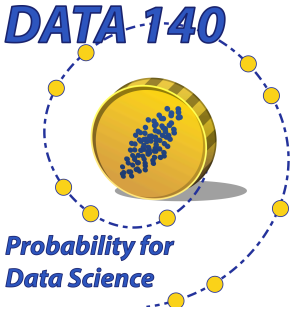

Fall 2024

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 9/23	Tue 9/24	Wed 9/25	Thu 9/26	Fri 9/27
	Lecture	Sections	Lecture	Mega Sections
HW 4 Due 5 PM HW 5 (due **NOON** Mon 9/30)			HW 5 Party 2-5 PM	Office Hours 2-4 PM
Lab 3B Due 5 PM No new lab				Past midterm walkthrough 4-6 PM
Skim Sec 9.1 and 9.2	Work through Chapter 9	Catch up on past content, or skim Ch 10.1 if you want to	Finish assignments. Review for midterm	Review for midterm.

Reading, Practice, and Class Meetings

Book	Topic	Lectures: Prof. A.	Sections: TAs	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 9/24 - Probabilities and expectation by conditioning and recursion	Wednesday 9/25 - Ch 9 Ex 1, 2, 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 9/26 - Introduction to Markov chains - Long run behavior	Friday 9/27 - Ch 9 Ex 5 - HW 5 Q1a, Q3ab - Some midterm practice if there is time	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.