

PROB 140

Fall 2021

WEEK 6 STUDY GUIDE



Probability for Data Science

The Big Picture

We develop an algorithm that uses a Markov chain to simulate a probability distribution on an intractably large outcome space.

- Many Markov chains, when run for a long time, exhibit different kinds of *balance*.
- *Monte Carlo* methods use simulation to address problems that are intractable by math or by complete enumeration.
- *Markov Chain Monte Carlo* (MCMC) can be used to simulate probability distributions on intractably large outcome spaces, even when the normalizing constant of the distribution can't be calculated.

Week At a Glance

Mon 9/27	Tue 9/28	Wed 9/29	Thu 9/30	Fri 10/1
	Instructor's Session		Instructor's Session	
		GSIs' Sessions		GSIs' Sessions
HW 5 Party 12-2PM HW 5 Due HW 6 (Due Mon 10/4)				
Lab 3 Due Lab 4 (Due Mon 10/4)				Lab 4 Party 5PM
Skim Sec 11.1	Read/watch Sec 11.1	Skim Sec 11.2, 11.3	Read/watch Sec 11.2, 11.3	Review for midterm

Reading, Practice, and Live Sessions

Sections	Topic	Live Sessions: Prof. Sahai	Live Sessions: GSIs	Recommended Practice
Ch 11	Detailed Balance and MCMC <ul style="list-style-type: none"> - 11.1 is about different kinds of balance, and how one of them can make it easy to identify the other - 11.2 solves the code-breaking problem with a tiny alphabet, by complete enumeration - 11.3 develops a general Markov chain Monte Carlo method that can be used to solve the problem with a large alphabet 	Tuesday 9/28 <ul style="list-style-type: none"> - Detailed balance - The code breaking problem, with a tiny alphabet 	Wednesday 9/29 Ch 11: - Ex 3, 5 Review for midterm: - Famous distribution	Ch 11 - Ex 4 - Kontantopolous Ex 25, 27
Ch 11	Detailed Balance and MCMC <ul style="list-style-type: none"> - 11.1 is about different kinds of balance, and how one of them can make it easy to identify the other - 11.2 solves the code-breaking problem with a tiny alphabet, by complete enumeration - 11.3 develops a general Markov chain Monte Carlo method that can be used to solve the problem with a large alphabet 	Thursday 9/30 <ul style="list-style-type: none"> - Using MCMC to solve the problem with a large alphabet - Q&A for midterm during lecture 	Friday 10/1 - Lab 4. Please attend – the lab will make much more sense if you do, and it's one of our rare one-week labs. Review for midterm: - Methods to find expectation	Review for midterm: - Ch 1 - 11

There are no exercises at the end of Chapter 10, because the methods of Chapter 11 make many problems easier to solve.