PROB 140

Probability for Data Science

Spring 2022

WEEK 4 STUDY GUIDE

The Big Picture

Expectation is the most important concept in this course. Do not skip these lectures.

- The most powerful property of expectation is additivity. We will cover many and varied uses of this.
- Expectation is used in the definition of the bias of an estimator, and hence also in the construction of unbiased estimators.
- In multi-stage experiments, expectation can be calculated iteratively by conditioning.

Week At a Glance

Mon 2/7	Tue 2/8	Wed 2/9	Thu 2/10	Fri 2/11
	Lecture	Sections: **Quiz 1**	Lecture	Sections
HW 3 Party 9AM-noon **HW 3 Due** HW 4 (Due Mon 2/14)				
Lab 2A Due No new lab				
Skim 8.4, 8.5; study for Quiz 1	Study for Quiz 1	Take a break	**Important:** Work through 8.4, 8.5	Work through Ch 9; it's short

Reading, Practice, and Live Sessions

Book	Topic	Lecture: Prof A.	Section: GSIs	Optional Additional Practice
8.4, 8.5	**Additivity of Expectation** - 8.4 is about additivity: the expectation of a sum is the sum of the expectations, regardless of dependence or independence. Hugely powerful. - Additivity helps us construct unbiased estimators based on averages - 8.5 uses additivity to develop the method of indicators for finding expected counts	Tue 2/8 - Additivity and some consequences: - Constructing unbiased estimators - Finding expected counts	Wed 2/9 - **Quiz 1** - Ch 8 Ex 8, 9	Chapter 8 All the exercises not covered in section
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	Thu 2/10 - Probabilities and expectation by conditioning and recursion	Friday 2/11 - Ch 8 Ex 11, 12 - Ch 9 Ex 4, 6	Chapter 9 All exercises not covered in section.