Fall 2024

WEEK 12 STUDY GUIDE

The Big Picture

We continue with inference for the unknown *p* of a coin, from a Bayesian perspective. Then we move to least squares estimation.

- The beta family is a rich class with which to describe our *prior* opinions about p; it then turns out that the same family describes our *posterior* opinion which is the prior updated based on the observed heads and tails.
- If you have the scatter diagram of simulated (X,Y) pairs, then Data 8 ideas say that given X, the best predictor of Y is the “center of the vertical strip at X.” Formally, “best” means “least squares,” and the “center of the vertical strip at X” is the conditional expectation of Y given X.
- The error in this estimate, given X, is the conditional SD of Y given X.
- This allows us to decompose the variance of Y into two easier pieces, by conditioning on X.

Week At a Glance

Mon 11/11	Tue 11/12	Wed 11/13	Thu 11/14	Fri 11/15
HOLIDAY	Lecture	Section	Lecture	Mega Section
	HW 11 Due at 9AM HW 12 (Due 5PM Mon 11/18)			HW 12 Party 2PM to 5PM
	Lab 7A Due at 9AM Lab 7B (Due 5PM Mon 11/18)		Lab 7B party 2PM to 5PM	
	Work through Sections 21.1, 21.2	Skim Sections 22.1-22.2	Work through Sections 22.1, 22.2.	Work through Sections 22.1, 22.2, 22.3, and Example 22.4.1

Reading, Practice, and Class Meetings

Book	Topic	Lectures: Prof. A.	Sections: TAs	Optional Additional Practice
Ch 21	**Inference for the *p* of a random coin** - 21.1 picks up from 20.3, with a general beta prior instead of uniform - 21.2 is about the unconditional distribution of the number of heads, which is called beta-binomial - 21.3 is omitted this term	Tuesday 11/12 - Inference for the random p of a coin - Conjugate priors; prediction - Relations between the beta and the binomial, including the beta-binomial distribution	Wednesday 11/13 - Ch 21 Ex 2, 3, 4	Ch 21 - All exercises not completed in section or homework
Ch 22	**An approach to prediction** - 22.1 develops the main reason why conditional expectation is important for prediction - 22.2 shows that conditional expectation is a least squares predictor, and defines the error in the estimate - 22.3 decomposes variance into two pieces, by conditioning	Thursday 11/14 - The random variable equivalent of “dropping a perpendicular” - Least squares prediction, and a new look at variance	Friday 11/15 - Ex 3, 5 - One question from Midterm 2	Ch 22 - Ex 1, 2