



## 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 11/7	Tue 11/8	Wed 11/9	Thu 11/10	Fri 11/11
	Lecture	Section	Lecture	
<b>HW 11 Due</b> HW 12 (Due Mon 11/14)				
<b>Lab 6A Due</b> Lab 6B (Due Mon 11/14)				
Skim Section 21.1	Work through Sections 21.1, 21.2	Skim 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: GSIs	Optional Additional Practice
Ch 21	<b>Inference for the <math>p</math> of a random coin</b> <ul style="list-style-type: none"> <li>- 21.1 picks up from 20.3, with a general beta prior instead of uniform</li> <li>- 21.2 is about the unconditional distribution of the number of heads, which is called beta-binomial</li> <li>- 21.3 is omitted this term</li> </ul>	<b>Tuesday 11/8</b> <ul style="list-style-type: none"> <li>- Inference for the random <math>p</math> of a coin</li> <li>- Conjugate priors; prediction</li> <li>- Relations between the beta and the binomial, including the beta-binomial distribution</li> </ul>	<b>Wednesday 11/9</b> <ul style="list-style-type: none"> <li>- Ch 21 Ex 2, 3, 4</li> </ul>	<b>Ch 21</b> <ul style="list-style-type: none"> <li>- All exercises not completed in section or homework</li> </ul>
Ch 22	<b>An approach to prediction</b> <ul style="list-style-type: none"> <li>- 22.1 develops the main reason why conditional expectation is important for prediction</li> <li>- 22.2 shows that conditional expectation is a least squares predictor, and defines the error in the estimate</li> <li>- 22.3 decomposes variance into two pieces, by conditioning</li> </ul>	<b>Thursday 11/10</b> <ul style="list-style-type: none"> <li>- The random variable equivalent of “dropping a perpendicular”</li> <li>- Least squares prediction, and a new look at variance</li> </ul>	<b>Friday 11/11</b> <b>Holiday</b>	<b>Ch 22</b> <ul style="list-style-type: none"> <li>- Ex 1, 2</li> </ul>