PROB 140

Probability for Data Science

Fall 2021

WEEK 15 STUDY GUIDE

The Big Picture

Simple linear regression predicts Y as a linear function of a single X. No matter what the joint distribution of X and Y, there is always a least squares line. If X and Y are bivariate normal, this line turns out to be the best among all predictors.

- A straightforward least-squares calculation results in the Data 8 formula for the equation of the regression line.
- Standard bivariate normal X and Y can be constructed so that Y is the sum of a linear function of X and independent normal noise.
- For the bivariate normal, the conditional expectation is a linear function of the given variable, and hence is the same as the best linear predictor.
- The regression line can be written in multiple forms, one of which extends to the case of multiple regression.

Week At a Glance

Mon 11/29	Tue 11/30	Wed 12/01	Thu 12/02	Fri 12/03
	Instructor's Session		Instructor's Session	
		GSIs' Sessions		GSIs' Sessions
	HW 14 (Due Tue 12/07)			HW 14 Party 3-6PM
Read Sections 24.3-24.4	Skim Sections 25.1-25.2	Skim Sections 25.3-25.4	Read Chapter 25	Review Chapter 25

Reading, Practice, and Live Sessions

Sections	Topic	Live Sessions: Prof. Sahai	Live Sessions: GSIs	Recommended Practice
Ch 24	**Simple Regression** - 24.1 derives the equation of the regression line - 24.2 constructs bivariate normal random variables so that the relation between can be expressed in terms of “linear signal plus noise’ - 24.3 looks at least-squares prediction in the context of the bivariate normal, and the connection with linear regression - 24.4 writes the regression equation in multiple different ways, each one illuminating a different property	Tuesday 11/30 - Regression and the bivariate normal - Linear predictor in higher dimensions Thursday 12/02 - Conditional expectation in high dimension matrix notation - Multivariate normal and multiple regression	Wednesday 12/01 - Ch 24 Ex 2, 3, 5 Friday 12/03 - Ch 24 Ex 1, 7 - Overview of Ch 25.4	Take a break from exercises, but read Ch 24 carefully.