
Spring 2023

# WEEK 14 STUDY GUIDE

## The Big Picture

We conclude the term with conditioning in the multivariate normal model, and inference in the standard multiple regression model.

- Return to general facts about the multivariate normal: When a multivariate normal vector is an invertible linear transformation of iid standard normals, it has a joint density, and the form of the joint density can be used to show that mutual independence follows from pairwise zero correlation.
- The regression line can be written in multiple forms, one of which extends to the case of multiple regression.
- Prediction based on multiple predictors has familiar properties: There is a general formula for the best linear predictor, which is a natural extension of the formula for simple regression; and if the underlying distribution is multivariate normal then the best linear predictor is also the best among all predictors.
- The multiple regression model with normal errors is fundamentally important in data science. Properties of the estimated parameters lead to straightforward methods of inference.

## Week At a Glance

| Mon 4/24 | Tue 4/25 | Wed 4/26 | Thu 4/27 | Fri 4/28 |
|---|---|---|---|---|
| | Lecture | Section | Lecture | Section |
| **HW 13 Due**<br>HW 14 (Due Mon 5/1) | | | | HW 14 party 3 PM to 5 PM |
| Focus on understanding HW 13 | Work through Chapter 24 | Skim Section 25.4; work on HW 14 | Work through Section 25.4 | Work on HW 14 |

## Reading, Practice, and Class Meetings

| Book | Topic | Lectures: Prof. A. | Sections: GSIs | Optional Additional Practice |
|---|---|---|---|---|
| Ch 24, 25 | **Towards Multiple Regression**<br>- 24.4 writes the regression equation in multiple different ways, each one illuminating a different property and making it easier to understand the corresponding formulas in multiple regression<br>- 25.1, 25.2, 25.3 extend the corresponding simple regression sections (24.1, 24.3, 24.4) to the multivariate case; we will just talk through these and not do the details<br>- 25.4 introduces the multiple regression model most commonly used in data science | Tuesday 4/25<br><br>- MSE in simple regression; connection with the bivariate normal<br>- The big picture of the multivariate case<br>- The multiple linear regression model: understanding the assumptions | Wednesday 4/26<br>- Ch 24 Ex 2, 3 | None; focus on the homework |
| | **Multiple Linear Regression**<br>- 25.4 continued: the estimates and their distribution under the model | Thursday 4/27<br><br>- Multiple linear regression model: parameter estimation and inference | Friday 4/28<br>- Ch 24 Ex 6, 7<br>- Multiple regression model True/False | |