DATA 140

Probability for Data Science

Fall 2025
WEEK 7 STUDY GUIDE

The Big Picture

We define and establish properties of the main measure of the variability in a distribution.

- The *standard deviation*, familiar to you from Data 8 as a measure of the spread in a data distribution, is defined as a measure of spread in the distribution of a random variable.
- *Variance*, which is the mean squared error and the square of the standard deviation, has better computational properties.
- *Covariance* helps calculate variances of sums and can be normalized to become *correlation*.
- General properties of variance and covariance help us calculate the variances of the main distributions.

Week At a Glance

Mon 10/6	Tue 10/7	Wed 10/8	Thu 10/9	Fri 10/10
	Lecture	Sections	Lecture	Mega sections
HW 6 Due 5PM HW 7 (due 5PM Oct 13)				HW 7 party 2PM - 5PM in Evans
Lab 4 Due 5PM Lab 5 (due 5PM Oct 13)			Lab 5 Party 9-12 in Warren	
Skim Sections 12.1, 12.3	Work through Sections 12.1, 12.2 12.3	Skim Chapter 13	Work through Chapter 13	Work through Chapter 13

Reading, Practice, and Class Meetings

Book	Topic	Lectures: Professor	Sections: TAs	Optional Additional Practice
Ch 12	**Variance and Standard Deviation** - 12.1 has the basics of SD and variance; much of this should be an easy read - 12.2 connects variance and prediction - 12.3 shows how expectation and variance can be used to bound the tails of a distribution - 12.4 has examples of distributions with heavy tails, for students interested in economics, natural language processing, etc	Tuesday 10/7 SD and variance: - Definition, alternative computational method, examples - Use in prediction - Tail bounds	Wednesday 10/8 Ch 12: - Ex 4, 5, 6	Ch 12 - All exercises not covered in section
Ch 13	**Covariance** - 13.1-2 define covariance and establish its main properties - 13.3 covers the important special case of sums of independent variables - 13.4 covers variances of dependent sums - 13.5 compares dependent and independent sums via a *correction factor*	Thursday 10/9 Variance of a sum: - Covariance and main properties - Sums of independent random variables - Handling dependence	Friday 10/10 - Ch 13 Ex 1, 11, 15 - A midterm problem	Ch 13 - 2, 3, 4, 6, 13