



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*.
- The expectation and standard deviation together help us see where the bulk of a distribution is, though the picture isn't very helpful when distributions have heavy tails.
- General properties of variance and covariance help us calculate the variances of the main distributions.

Week At a Glance

Mon 10/5	Tue 10/6	Wed 10/7	Thu 10/8	Fri 10/9
	Instructor's Session		Instructor's Session	
		GSI's Sessions		GSI's Sessions
Checkpoint Week 7 (Due Wed 10/7)		Checkpoint Week 6 Due		
HW 5 Party 6-7PM HW 5 Due HW 6 (Due Mon 10/12)				HW 6 Party 6-7PM
Lab 3 Due Lab 4A (Due Mon 10/12)			Lab 4A Party 6-7PM	
Read Sec 12.1, skim Sec 12.2	Read Chapter 12 (Sec 12.4 is optional)	Read Sec 12.3, skim Sec Sec 13.1	Read Sections 13.1-13.3, skim 13.4	Read Chapter 13

Reading, Practice, and Live Sessions

Sections	Topic	Live Sessions: Prof. A.	Live Sessions: GSIs	Recommended Practice
Ch 12	<p>Variance and Standard Deviation</p> <ul style="list-style-type: none"> - 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 	<p>Tuesday 10/6</p> <p>SD and variance:</p> <ul style="list-style-type: none"> - Definition, alternative computational method, examples - Use in prediction - Tail bounds <p>Checkpoint is based on Chapter 12</p>	<p>Wednesday 10/7</p> <p>Ch 12:</p> <ul style="list-style-type: none"> - Ex 4, 5, 6 	<p>Ch 12</p> <ul style="list-style-type: none"> - All exercises not covered in section
Ch 13	<p>Covariance</p> <ul style="list-style-type: none"> - 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 <i>correction factor</i> 	<p>Thursday 10/1</p> <p>Variance of a sum:</p> <ul style="list-style-type: none"> - Covariance and main properties - Sums of independent random variables - Handling dependence 	<p>Friday 10/9</p> <p>Ch 13:</p> <ul style="list-style-type: none"> - Ex 1, 11, 13 	<p>Ch 13</p> <ul style="list-style-type: none"> - 2, 3, 4, 6, 15, 16