



WEEK 13 STUDY GUIDE

The Big Picture

We write familiar facts about expectation and covariance in matrix notation, and use them to study the most important joint distribution in data science.

- Linear algebra helps us express properties of sequences of random variables. Expectation and variance are replaced by mean vectors and covariance matrices.
- The multivariate normal distribution has a few equivalent definitions, chief among which is that multivariate normal variables can be represented as a linear transformation of i.i.d. standard normals.
- Linear combinations of multivariate normal random variables are normal; multiple linear combinations are multivariate normal; and pairwise uncorrelated multivariate normal variables are independent.

Week At a Glance

Mon 11/16	Tue 11/17	Wed 11/18	Thu 11/19	Fri 11/20
	Instructor's Session		Instructor's Session	
		GSI's Sessions		GSI's Sessions
Checkpoint Week 13 (Due Wed 11/18)		Checkpoint Week 13 Due		
HW 10 Party 6-7PM HW 10 Due HW 11 (Due Mon 11/23)				HW 11 Party 6-7PM
Lab 6B Due Lab 7 (Due Mon 11/23)			Lab 7 Party 6-7PM	
Skim Sections 23.1	Read Section 23.1, skim 23.2	Skim Sections 23.2 to 23.4	Read Chapter 23	Work some exercises from Ch 23

Note: The lab is due in one week, not two, because it's a workout in the construction of the multivariate normal. The earlier you do it, the easier it will be for you to understand what's happening in the chapter.

Reading, Practice, and Live Sessions

Sections	Topic	Live Sessions: Prof. A.	Live Sessions: GSIs	Recommended Practice
Ch 23	<p>Multivariate Normal Vectors</p> <ul style="list-style-type: none"> - 23.1 derives the mean vector and covariance matrix of a linear transformation of a random vector; covariance matrices are positive semidefinite - 23.2 defines the multivariate normal distribution in three equivalent ways; the two-dimensional case is called bivariate normal - 23.3 is about linear combinations of multivariate normals: they are also multivariate normal, and marginals are normal. But normal marginals don't imply multivariate normal joint distribution - 23.4 shows that for multivariate normal variables, being pairwise uncorrelated is equivalent to independence 	<p>Tuesday 11/17</p> <ul style="list-style-type: none"> - Random vectors and linear transformations - Multivariate normal and properties <p>Checkpoint is based on Section 23.1</p> <p>Thursday 11/19</p> <ul style="list-style-type: none"> - Multivariate normal and properties, continued 	<p>Wednesday 11/18</p> <ul style="list-style-type: none"> - Ch 23 Ex 2, 3 <p>Friday 11/20</p> <ul style="list-style-type: none"> - Ch 23 Ex 5, 6 	<p>Ch 23</p> <ul style="list-style-type: none"> - Any exercise not covered in section or assignments