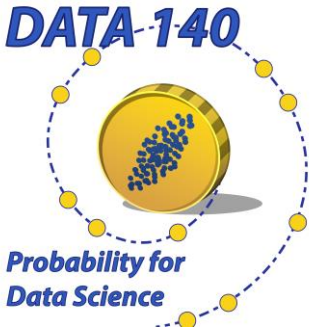

Fall 2023

WEEK 8 STUDY GUIDE

The Big Picture

We move to random variables with a continuum of values, via one of the most important theorems in probability.

- We know how to find expectations and variances of sums of random variables. To find the distribution of a sum, we can use partitioning as before. But a more abstract math concept of a *probability generating function* lets us quickly calculate distributions of sums in special cases.
- Many of the simulations in Data 8 are evidence of the *Central Limit Theorem* in action: the distribution of the sum of a large i.i.d. sample is roughly normal. We use this to construct confidence intervals for the population mean.
- The normal is a continuous curve that acts as a probability distribution. We formally define the *density* of a random variable with a continuum of values, and extend the concepts of cdf and expectation to this situation.
- Along with the normal, we study two major distribution families: the uniform and the exponential.

Week At a Glance

Mon 10/9	Tue 10/10	Wed 10/11	Thu 10/12	Fri 10/13
	Lecture	Sections	Lecture	Mega Sections
Lab 5 due Lab 6A (due Mon 10/16)			Lab 6A Party (10 AM to noon)	
HW 7 Due HW 8 (Due Mon 10/16)				HW 8 party (2 PM to 4 PM)
Skim Sections 14.1-14.2	Work through Sections 14.1-14.2, skim the rest of Ch 14	Work through Ch 14, skim Section 15.1	Work through Sections 15.1-15.2	Work through Sections 15.1-15.4

Reading, Practice, and Class Meetings

Sections	Topic	Lectures: Instructors	Sections: GSIs	Optional Additional Practice
Ch 14	**Sums and the CLT** - 14.1-14.2 cover an abstract math method for understanding probability distributions; 12.2 finds exact distributions of i.i.d. sample sums. - 14.3 states the Central Limit Theorem and formally defines the normal curve - 14.4 shows how to work with the normal curve in Python; **this is for you to read by yourself** - 14.5-14.6 cover the distribution of the i.i.d. sample mean, and hence the use of the sample mean in confidence intervals	Tuesday 10/10 - Our first generating function: a math technique for understanding distributions - The CLT and some consequences	Wednesday 10/11 Ch 14: - Ex 1, 4, 6	Ch 14 - 2, 3, 5, 7
Ch 15	**Random Variables with Densities** - 15.1-15.2 define a “continuous” probability histogram, and generalize the concept of density from Data 8 histograms - 15.3 covers expectation (including variance) and has examples including the uniform distribution family - 15.4 covers the exponential distribution family - 15.5 shows how to do calculus in SymPy, included in your lab	Thursday 10/12 Random variables on a continuum of values: extending all previous concepts to this case, and recognizing a benefit of the continuous world: single points don’t affect probability calculations	Friday 10/13 Ch 15: - Ex 1, 3, 5	Ch 15 - 2, 9, 10, 11