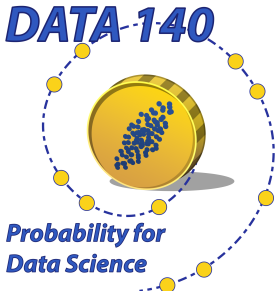

Fall 2023

WEEK 10 STUDY GUIDE

The Big Picture

The beta, normal, and gamma families are heavily used in modeling. We study these, along with a generating function that helps understand them better.

- We start by establishing some properties of the beta family.
- We establish some properties of the standard normal that we have taken for granted without proof. We notice connections with gamma distributions. By simulation, we notice key properties of sums: sums of independent normals are normal, and sums of independent gammas (with the same rate) are gamma.
- The two most important branches of the gamma family have integer or half-integer shape parameters.
- The *moment generating function* (mgf) is more powerful than probability generating functions for dealing with sums. This helps us establish the properties of normal and gamma families that we observed by simulation.

Week At a Glance

Mon 10/23	Tue 10/24	Wed 10/25	Thu 10/26	Fri 10/27
	Lecture	Sections	Lecture	Mega sections
Lab 6B Due				
HW 9 Due HW 10 (**due 12 NOON Monday 10/30**)				Past midterm walk-through, review: 2PM - 4PM
Skim Section 17.4, 18.1	Work through Section 17.4, Chapter 18	Work through Chapter 18; skim Section 19.1	Work through Sections 19.1, 19.2.	Study for the midterm

Reading, Practice, and Class Meetings

Book	Topic	Lectures: Instructors	Sections: TAs	Optional Additional Practice
Ch 18	**Normal and gamma families** - 18.1 establishes the normal density, mean, and variance, and in the process discovers an important fact about sums of squares of standard normals. You *have* to know the results even if you don't follow some of the proofs. - 18.2 observes by simulation that sums of independent normals are normal, and uses this in exercises - 18.3 observes by simulation that sums of independent gammas with the same rate are gamma, and studies one major branch of the gamma family - 18.4 studies the other major branch	Tuesday 10/24 - The beta family (Section 17.4) - Fundamental properties of the standard normal - The gamma family and its relation to squares of centered normals	Wednesday 10/25 - Ch 17 Ex 4ef, 5ac - Ch 18 Ex 2, 4	Ch 18 - Ex 1, 3, 5, 8
Ch 19	**Moment generating functions** The first two sections parallel the start of Ch 14 on the pgf - 19.1 has a formula for the density of a sum, but it's often intractable - 19.2-3 define the mgf and examine its uses	Thursday 10/26 - Convolution formula for the density of a sum - Moment generating functions: definition, some of the main uses (to be continued after the midterm)	Friday 10/27 (Midterm review) - Ch 18, Ex 5 - Ch 17, Ex 6 - Ch 14, Ex 5 - Ch 13, Ex 13	Ch 19