Spring 2024

WEEK 9 STUDY GUIDE

The Big Picture

More technique! And establishing some normal distribution results we have taken for granted without proof.

- To study the joint behavior of two random variables, we define their joint density, which is the analog of the discrete joint distribution. Probabilities and expectations are now double integrals.
- The family of *beta* densities is important for machine learning and offers a good example of how joint densities can be constructed.
- We establish some basic properties of the standard normal. 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.

Week At a Glance

Mon 3/11	Tue 3/12	Wed 3/13	Thu 3/14	Fri 3/15
	Lecture	Sections	Lecture	Mega Sections
Lab 6A Due Lab 6B (**Due NOON Mon 3/18**)			Lab 6B Party 10 AM to noon	
HW 8 Due HW 9 (**Due NOON Mon 3/18**)				HW 9 Party 2 PM to 5 PM
Skim Sec 17.1	Work through Sec 17.1 carefully, skim Sections 17.2-3	Work through Chapter 17	Work through Chapter 17	Review for midterm

Reading, Practice, and Class Meetings

Book	Topic	Lectures: Prof. A.	Sections: TAs	Optional Additional Practice
Ch 17	**Joint Densities** - 17.1-17.3 are the 2-dimensional counterparts of Ch 15 and the density version of Chapter 4. The examples in the videos aren't always the same as those in the text. - 17.4 is one of the "big name" families of densities	Tuesday 3/12 - Joint densities - The beta family	Wednesday 3/13 - Ch 17 Ex 2, 4, 7	Ch 17 - Ex 1, 9
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	Thursday 3/14 - Fundamental properties of the standard normal - The gamma family and its relation to squares of centered normals	Friday 3/15 - Past midterm questions	Postponed till next week. Study for the midterm.