Fall 2023

WEEK 3 STUDY GUIDE

The Big Picture

This week is largely about two of the principal families of distributions: the binomial and the Poisson.

- Random samples often result in random counts, such as the number of voters who favor a candidate. The distribution of the count depends on the method of sampling.
- If the sample is a fixed number of i.i.d. success/failure trials, the distribution of the number of successes is *binomial.* The shape of the distribution can be understood by using consecutive odds ratios.
- In some situations, the binomial distribution is well approximated by a *Poisson* distribution. The Poisson is our first distribution on infinitely many values.
- Randomizing parameters can have dramatic effects on dependence and independence. A Poisson number of i.i.d. success/failure trials has beautiful and powerful properties.

Week At a Glance

Monday 9/4	Tuesday 9/5	Wednesday 9/6	Thursday 9/7	Friday 9/8
	Lecture	Sections	Lecture	Mega Sections
	HW 2 Due AT NOON HW 3 (Due 5 PM Mon 9/11)			HW 3 Party 2PM - 4PM
	Lab 2A Due AT NOON Lab 2B (Due 5 PM Mon 9/11)		Lab 2B party 10AM - 12 noon	
	Work through 6.1, 6.2, skim 6.5	Work through Chapter 6	Skim 7.1, 7,2	Work through Ch 7

Reading, Practice, and Class Meetings

Book	Topic	Lectures: Instructors	Sections: GSIs	Optional Additional Practice
Ch 6	**Binomial and its relatives** - 6.1 is about a fixed number of i.i.d. success/failure trials; the number of successes has a *binomial* distribution - 6.2 has examples you should read - 6.3 extend the binomial to the *multinomial* case where each trial has several possible outcomes, not two - 6.4 compares the number of successes when sampling with replacement (binomial) and the number of successes when sampling without replacement (hypergeometric), and shows when the two are almost the same - 6.5 examines the shape of the binomial histogram, and identifies the mode, by studying odds ratios - 6.6 uses odds ratios to show that under some conditions the binomial has a *Poisson* limit	Tuesday 9/5 - Straightforward but important observations about success counts - Deeper dive into the math to explain what we see - An approximation, leading to a new class of distributions	Wednesday 9/6 - Ch 6 Ex 2, 9, 11	Chapter 6 1, 4, 12
Ch 7	**Poissonization** - 7.1 has properties of the Poisson distribution - 7.2 asks the same questions as 6.1, but with a Poisson number of trials - 7.3 extends this to trials with more than two categories, analogous to 6.3	Thursday 9/7 Poissonization: - Beautiful calculations with surprising results - Pay attention to the math because you'll need the methods again	Friday 9/8 Poisson approximation and Poissonization: - Ch 6 Ex 10 - Ch 7 Ex 2 - Ch 7 Ex 7 - Ch 7 Ex 8 Relations with other exercises	Chapter 7 3, 4, 5

Lab 2 is about measuring the quality of the Poisson approximation in 6.6.