OpenIntro

MA213 L3

L3: Simulation (Chapter 2.3) and probability

OpenIntro Statistics, 4th Edition

Slides developed by Mine Çetinkaya-Rundel of OpenIntro.

L3 : Simulation and Probability

- *Previously:* What we learend from last time
- *This time:* What we are learing today
- *Deadlines/Announcements:* Quiz / Exercise / Explain / after work?

Lesson Plan

- xx min Purpose of Simulation (maybe visualization)
- xx min review of $E(X)$, $Var(X)$ and linear combination of RV
- xx min Excercise using R (Rmd file)

Learning Objectives

- Validate and Explain Probability Distributions: Assess the validity of a probability distribution using the concepts of outcome, sample space, and probability properties (e.g., disjoint outcomes, probabilities between 0 and 1, and total probabilities summing to 1). [Q2, L3]
- Compute Probabilities Using Various Tools: Use logic, Venn diagrams, and probability rules to compute probabilities for events. [Q2, L3]
- Understand and Compute Expectations and Variances: Explain the concepts of expectations and variances of random variables, and compute the expectation and variance of a linear combination of random variables. [Q2, L3]

Learning Objectives Con't

- Conduct Hypothesis Testing Using Simulation: Set up null and alternative hypotheses to test for independence between variables, and use simulation techniques to evaluate data support for these hypotheses. [Q1, L3]
- Simulating $E[a + bX]$, $Var[a + bX]$, $E[X + Y]$, $Var[X + Y]$ (independent) – learning how to simulate and the relationships between sampling and the probability distributions

Excercise using R

1. Show lists of dstn functions in R
2. Generate random sample from different group/individual depending on the context
3. how to obtain $E(X)$, $Var(X)$ in R?
4. Generate sample of $a + bX$
5. Obtain $E(a + bX)$, $Var(a + bX)$ and compare from R and theoretical values

go over from $2, \ldots, 5$ for $X + Y$