Pre-class preparation

Please watch the following video:

- Video: Conditional probability

Objectives

By the end of the day's class, students should be able to do the following:

- Define conditional probability in terms of set theory notation and in everyday language.
- Explain the difference between a conditional probability and an unconditional probability.
- State Bayes' rule and the Law of Total Probability.
- Apply Bayes' rule and the Law of Total Probability to compute desired probabilities.

Reflection Questions

Please submit your answers to the following questions to the corresponding Canvas assignment by 9:00AM:

1. If A and B are disjoint events with $P(B) > 0$, what is the value of $P(A|B)$? Show this mathematically, but also provide an intuitive explanation in words.

   $A \cap B = \emptyset$ so $P(A \cap B) = 0$. Then $P(A|B) = 0/P(B) = 0$. Conditioning on B tells us that B has occurred. But since they are disjoint events, this means A cannot occur once B has.

2. Each time I go to the grocery store, I will choose to buy eggs from farm A or farm B. For each purchase after the first, the probability is $\frac{2}{3}$ that I will choose the same farm as the purchase before, and the probability is $\frac{1}{3}$ that I will switch farms. Suppose that I am equally likely to pick farm A or farm B for the first purchase. What is the probability that my first two eggs purchases will be from farm A and the third and fourth purchases will be from farm B? *Be clear on how you define events!*

   Let A be the event of choosing farm A on first purchase, B of choosing farm A on second purchase, C choosing farm B on third purchase, and D choosing farm B on fourth. We want $P(A \cap B \cap C \cap D) = P(A)P(B|A)P(C|A,B)P(D|A,B,C) = \frac{1}{2}\left(\frac{2}{3}\right)\left(\frac{1}{3}\right)\left(\frac{2}{3}\right) = \frac{2}{27}$

3. (Optional) Is there anything from the pre-class preparation that you have questions about? What topics would you like would you like some more clarification on?