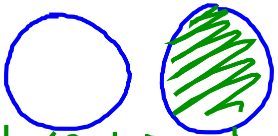
Friday, November 30, 2018



disjoint -> not independent

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

$$P(A \cap B) = P(A) \times P(B \mid A)$$

$$P(B \mid A) = \frac{P(A \cap B)}{P(A)}$$

- Warm-up
  - If P(A) = 0.25 and P(B) = 0.4, what is P(A ∪ B) if A and B are disjoint?

    $P(A) + P(B) - P(A \cap B)$

    $0.25 + 0.4 - 0$

    0.65

  - If P(A) = 0.25 and P(B) = 0.4, what is P(A ∩ B) (if A and B are independent)?

    $P(A) \times P(B \mid A)$

    $0.25 \times 0.4 = 0.1$

    $P(B) = P(B \mid A)$

  - If P(A) = 0.25 and P(B) = 0.4, what is P(A|B)? $P(A \mid B) = \frac{P(A \cap B)}{P(B)} = \frac{0.1}{0.4}$

    $P(A)$ $= 0.25$

- Check Homework
  - More Practice with Probability

Objectives

Content Objective: I will solve problems involving probability.

Social Objective: I will stay focused to complete as many problems as possible.

Language Objective: I will use correct vocabulary in discussion problems.

It Depends…

- Back in Chapter 3, we looked at contingency tables and talked about conditional distributions.
- When we want the probability of an event from a *conditional* distribution, we write $P(\mathbf{B}|\mathbf{A})$ and pronounce it "the probability of **B** *given* **A**."
- A probability that takes into account a given condition is called a conditional probability.

Conditional Probability with tables

$$\frac{\frac{14}{27}}{\frac{16}{27}}$$

	Pierced	Not Pierced	total
Male	2	10	12
Female	14	1	15
total	16	11	27

$$\frac{14}{27}\cdot\frac{\cancel{27}}{16}$$

$$\frac{14}{16}$$

$$P(F \cup P) = P(F) + P(P) - P(F \cap F)$$

$$\frac{2}{27} + \frac{14}{27} + \frac{1}{27} = \frac{17}{27}$$

$$P(F/P) = \frac{P(F \cap P)}{P(P)}$$

- P(female) = $\frac{15}{27}$
- P(pierced) = $\frac{16}{27}$
- P(female $\cap$ and piercing) = $\frac{14}{27}$
  $(F \cap P)$
- P(female or piercing) = $\frac{15}{27} + \frac{16}{27} - \frac{14}{27} = \frac{17}{27}$
- P(female | piercing) = $\frac{14}{16}$
- P(piercing | female) = $\frac{14}{15}$

Independence

- Independence of two events means that the outcome of one event does not influence the probability of the other.
- With our new notation for conditional probabilities, we can now formalize this definition:
  - Events **A** and **B** are independent whenever $P(\mathbf{B}|\mathbf{A}) = P(\mathbf{B})$. (Equivalently, events **A** and **B** are independent whenever $P(\mathbf{A}|\mathbf{B}) = P(\mathbf{A})$.)

Are the events "being pierced" and "being female" independent?

$P(F \mid P) \stackrel{?}{=} P(F)$

$\frac{14}{16} \stackrel{?}{=} \frac{15}{27}$

not =

not independent

$P(P \mid F) \stackrel{?}{=} P(P)$

$\frac{14}{15} \stackrel{?}{=} \frac{16}{27}$

not =

not independent

$P(F)$ $\quad$ $P(F \mid W)$

$\frac{15}{27}$ $\quad$ $\frac{4}{8}$

0.55 $\quad$ 0.5

Video to refresh…

Homework

Pages 361
(9,10, 15-20)