MATH 118 Probability and Statistics

Final Presentation

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Topics to be covered and Why?

1. Topics
   - Probability of an Event
   - Conditional Probability

2. Why did I choose these topics?
   - When I analyze our topics along the semester, I saw that these two topics are very important topics for probability, and they are frequently used topics in real life. Also, I have chose 2 different topic, because first we need to understand what is probability, then we can study conditional probability.

- Let Start with Probability of an Event.

Probability of an Event

Event

Event is an outcome or occurrence that has a probability assigned to it.

Probability of an Event

$$Probability = \frac{\text{The number of wanted outcomes}}{\text{The number of possible outcomes}}$$

If an experiment can result in any one of P different equally likely outcomes, and if exactly w of these outcomes correspond to event A, then the probability of event A is

$$P(A) = \frac{\mathrm{w}}{\mathrm{P}},$$

$$0 \leq P(A) \leq 1.$$

Example

Each of the letters HELLO is written on a card. A card is chosen at random from the bag. What is the probability of getting the letter 'L'?

Solution

Since the card is randomly selected, it means that each card has the same chance of being selected. The sample space for this experiment is;

$$S = \{H, E, L_1, L_2, O\}$$

There are two cards with the letter 'L'.

$$\text{Let A} = \text{event of getting the letter 'L'} = \{L_1, L_2\}$$

$$P(A) = \frac{2}{5}$$

Conditional Probability

Conditional Probability

Conditional Probability is a probability which measure the probability of one event occurring relative to another occurring.

How to express?

If we want to express the probability of one event happening given another one has already happened, we use the " $|$ " symbol to mean "given", and we say;

$P(A \mid B) =$ The probability of A given that we know B has happened.

Definition

If A and B are two events in a sample space S, then the conditional probability of A given B is defined as

$$P(A \mid B) = \frac{P(A \cap B)}{P(B)} \quad \text{when} \quad P(B) > 0.$$

Example

Netflix says that(approximately);

- 10,234,231 people watched Zootopia movie on Netflix
- 3,110,153 people watched both Zootopia and Monsters movies on Netflix

What is the probability that a user will watch Monsters, given that he/she watched Zootopia?

Solution

$P(A \cap B) =$ people who watched both Zootopia and Monsters on Netflix

$P(B) =$ people who watched Zootopia on Netflix

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

$$P(A \mid B) = \frac{P(A \cap B)}{P(B)} = \frac{3,110,153}{10,234,231} = 0.30$$

Example

A Ph.D. graduate has applied for a job with two universities: A and B. The graduate feels that she has a 60% chance of receiving an offer from university A and a 50% chance of receiving an offer from university B. If she receives an offer from university B, she believes that she has an 80% chance of receiving an offer from university A.

- What is the probability that both universities will make her an offer?

Solution

From question we have;

$$P(A) = 0.6$$

$$P(B) = 0.5$$

$$P(A \mid B) = 0.8$$

- $P(A \cap B) = ?$

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

$$P(A \cap B) = 0.5 \times 0.8 = 0.4$$

Summary

- First, we understand what is probability, event and probability of an event.
- We see some of basic examples of the probability.
- Then, we study conditional probability.
- Lastly, we have finished with a good example of conditional probability.

References that was used

- Probability and Statistics for Engineers and Scientists 9th edition
- Head First Statistics 1st Edition
- Some Other References from internet

Thank You...

Are there any questions?