STAT 384 Stochastic Process

Semester- Fall-2024

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Preamble

- **Basic Probability & Laws**

Learning Outcomes

Student will able to learn about:

- Basic concept of conditional probability.
- Calculation of conditional probability.

Conditional Probability

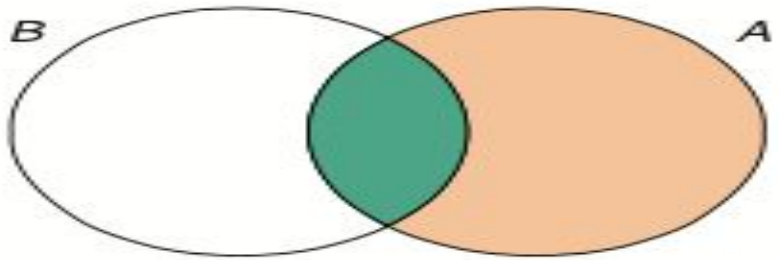
Introduction

- **We are often interested in determining probabilities when some partial information concerning the outcome of the experiment is available. In such situations, the probabilities are called *conditional probabilities*.**
- **One event effect on other event**

Definition

The conditional probability of B, given A, denoted by $P(B|A)$, is defined by

$$P(B|A) = \frac{P(A \cap B)}{P(A)}, \quad \text{provided} \quad P(A) > 0.$$



- P(AB)=P(A)P(B) Independent
- P(Aand B)=P(AB)=P(A).* P(B/A) Dependent
- P(ABC)=P(A)*P(B/A)*P(C/AB))

Question

- A bag contain 10 White and 5 black balls. Two balls are drawn at random one after the other without replacement. Find probability that both balls drawn are black

Question

- Four Cards are drawn without replacement . What is the probability that they are all aces.

- A box contain 15 items, 4 of which are defective and 11 are good. Two items are selected . What is the probability that first is good and second is defective in case of dependent.

- Ans 22/105

Practice Questions

- **The probability that a regularly scheduled flight departs on time is P(D) = 0.83; the probability that it arrives on time is P (A) = 0.82; and the probability that it departs and arrives on time is P (D ∩ A) = 0.78.**

  Find the probability that a plane

a. **arrives on time, given that it departed on time**

b. **departed on time, given that it has arrived on time.**

- The Probability that a man will be alive in 25 years is 3/5, and the probability that his wife will be alive in 25 years is 2/3. Find the probability that (i) both will be alive, (ii) only the man will be alive, (iii) only the wife will be alive, (iv) at least one will be alive, and (v) neither will be alive in 25 years.

Iv P(AUB)

Practice Questions

- **A class in advanced physics is composed of 10 juniors, 30 seniors, and 10 graduate students. The final grades show that 3 of the juniors, 10 of the seniors, and 5 of the graduate students received an A for the course. If a student is chosen at random from this class and is found to have earned an A, what is the probability that he or she is a senior?**

Solution

	Junior	Senior	Graduate	total
	10	30	10	50
A grade	3	10	5	18

P(A) = 18 / 50

P(S and A) = 10 seniors / 50 students who received an A

P(S|A) = (10/50) * (50/18)

P(S|A) = 5/9

Practice Questions

- **It is estimated that 30 percent of all adults in the United States are obese, 3 percent of all adults suffer from diabetes, and 2 percent of all adults both are obese and suffer from diabetes. Determine the conditional probability that a randomly chosen individual**

a. **Suffers from diabetes given that he or she is obese**

b. **Is obese given that she or he suffers from diabetes**

solution

- A= The event that a randomly chosen individual is obese.
- D = The event that a randomly chosen individual suffers from diabetes.

P(A)= 0.30

P(D)=0.03

P(AnD)=0.02

P(D/A)=0.02/0.30

P(A/D)

Practice Questions

- **The probability that the head of a household is home when a telemarketing representative calls is 0.4. Given that the head of the house is home, the probability that goods will be bought from the company is 0.3. Find the probability that the head of the house is home and goods are bought from the company**.

Q & A