MIND MAP : LEARNING MADE SIMPLE

CHAPTER - 13

Probability

Random Variable

Real valued function whose domain is the sample space of a random experiment.

Mean of a random variable

The probability distribution of a random variable x is the system of numbers x: $x_1 \quad x_2 \quad \ldots, x_n$
$P(x)$: $p_1 \quad p_2 \quad \ldots \quad p_n$ where, $pi>0$,
$\sum_{i=1}^{n} p_i = 1, \quad i = 1.2, \ldots, \quad n.$

Let x be *a* R.V. whose possible values $x_1, x_2, \ldots, x_n$ occur with probabilities $p_1, p_2, \ldots, p_n$ resp. Then, mean of $x, \mu = \sum_{i=1}^{n} x_i p_i$ It is also called the expectation of x, denoted by $E(x)$

Variance and standard deviation

Let x be a R.V. whose possible values $x_1\ x_2, \ldots, x_n$ occurs with probabilities $p(x_1), p(x_2), \ldots, p(x_n)$ respectively. Let, $\mu = E(x)$ be the mean of x. The variance of x, var (x) or $\sigma_x^2 = \sum_{i=1}^{n} (x_i - \mu)^2 p(x_i)$ or $E(x-\mu)^2$

The non-negative number

$6x = \sqrt{\text{var}(x)} = \sqrt{\sum_{i=1}^{n} (x_i - \mu)^2 p(x_i)}$ is called the standard deviation of the R.V. 'X'. Also,

$\text{var}(x) = E(x^2) - [E(x)]^2$ For *eg*: $E(x) = 3$ and $E(x^2) = 10$, then var $x = 10 - 9 = 1$ and SD $= \sqrt{1} = 1$.

Bernoulli's Trials

Trials of a random experiment are called Bernoulli trials, if they satisfy the following conditions :

(i)There should be a finite no. of trials.

(ii)The trials should be independent.

(iii)Each trial has exactly two outcomes: success or failure.

(iv)The probability of success remains the same in each trial.

For Binomial distribution, B (n, p), $P(X = x) = ({}^nC_x q^{n-x} p^x, x = 0, 1, \ldots, n)$ $(q = 1 - p)$

Conditional Probability

The probability of the event E is called the conditional probability of E given that F has already occurred, and is denoted by $P(E/F)$. Also,

$P(E/F) = \frac{P(E \cap F)}{P(F)}, P(F) \neq 0.$

Properties

(i) $0 \le P(E/F) \le 1$, $P(E'/F) = 1 - P(E/F)$

(ii) $P((E \cup F)/G) = P(E/G) + P(F/G) - P((E \cap F)/G)$

(iii) $P(E \cap F) = P(E)P(F/E), P(E) \neq 0$

(iv) $P(E \cap F) = P(F)P(E/F), P(F) \neq 0$

For *eg* : if $P(A) = \frac{7}{13}$, $P(B) = \frac{9}{13}$ and $P(A \cap B) = \frac{4}{13}$, then

$P(A/B) = \frac{p(A \cap B)}{P(B)} = \frac{\frac{4}{13}}{\frac{9}{13}} = \frac{4}{9}.$

If E and F are independent, then $P(E \cap F) = P(E)P(F)$, $P(E|F) = P(E), P(F) \neq 0$ and $P(F|E) = P(F), P(E) \neq 0$.

Theorem of total probability

Let, $\{E_1, E_2 \ldots E_n\}$ be a partition of a sample space 'S' and suppose that each of $E_1, E_2, \ldots E_n$ has non-zero probability. Let 'A' be any event associated with S, then $P(A) = P(E_1)P(A|E_1) + P(E_2)P(A|E_2) + \ldots + P(E_n)P(A|E_n)$.

Bayes' Theorem

If $E_1, E_2, \ldots, E_n$ are events which constitute a partition of sample space S, *i.e.*, $E_1, E_2, \ldots E_n$ are pair wise dis joint and $E_1 \cup E_2 \cup \ldots \cup E_n = S$ and A be any event with non-zero probability,

then $P(E_i | A) = \frac{P(E_i)P(A|E_i)}{\sum_{j=1}^{n} P(E_j)P(A|E_j)}$

Get More Learning Materials Here : CLICK HERE www.studentbro.in