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1) probability

$$P(A) = \frac{\text{No. of points in event } A}{\text{No. of points in sample space.}}$$

2] Permutation

$$^nP_r = \frac{n!}{(n-r)!}$$

3] Combination

$$^nC_r = \frac{n!}{(n-r)!\,r!}$$

4] Binomial Distribution

$$P(x) = [^nC_r] \times [p^r] \times [q^{n-r}]$$

p = probability of success
q = probability of failure

$$\boxed{p + q = 1}$$

5) Poission Distribution

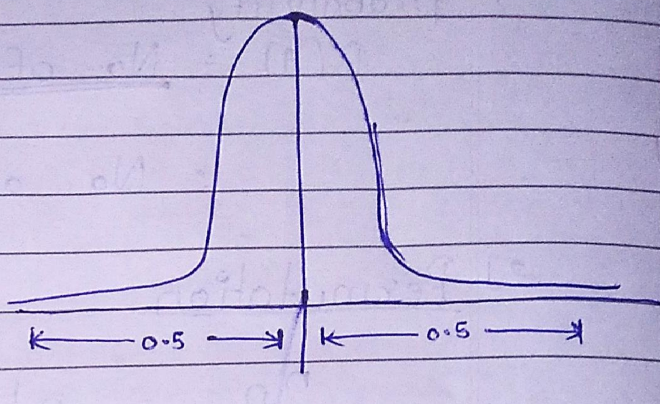
$$p(x) = \frac{e^{-m} \times m^r}{r!}$$

m = mean
n = tota no.
p = probability

$m = n \times p$

6] Normal Distribution

$$Z = \frac{x - \mu}{\sigma}$$



7] Conditional Probability

$$p(B/A) = \frac{P(A \cap B)}{P(A)}, \quad p(A) \neq 0$$

Also

$$p(A/B) = \frac{P(A \cap B)}{P(B)}, \quad p(B) \neq 0$$

8] Addition theorem of probability

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

or

$$p(A + B) = P(A) + P(B) - P(AB)$$

[If A & B are mutually exclusive event then $p(A \cap B) = 0$

$\therefore P(A \cup B) = P(A) + P(B)$]

9] Multiplication theorem of probability

$$P(A \cap B) = P(AB) = P(A) \cdot P(B/A)$$

$$P(A \cap B) = P(AB) = P(B) \cdot P(A/B).$$

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[If A & B are independent sets then
$P(A \cap B) = P(A) \cdot P(B)$]

5. Eigen Values & Eigen Vector

1) Inverse of matrix by adjoint method :

$$A^{-1} = \frac{1}{|A|} \times \text{Adjoint of } A$$

$$A \cdot A^{-1} = I$$

2) Eigen value & Eigen vector

$$A x = \lambda x$$

x — eigen ~~value~~ vector

λ — eigen value

$$A x = \lambda x$$
$$A x - \lambda x = 0$$
$$(A - \lambda) x = 0$$
$$(A - \lambda I) x = 0$$

3) Rank of matrix :

The total number of non-zero row in matrix, is the rank of the matrix

1) Fitting of straight Line

$$y = a + bx \text{ ——— To find}$$
$$\Sigma y = na + b\Sigma x$$
$$\Sigma xy = a\Sigma x + b\Sigma x^2$$

2) Fitting of ~~straight~~ 2nd degree polynomial / parabola

$$y = a + bx + cx^2 \text{ ——— To find}$$
$$\Sigma y = na + b\Sigma x + c\Sigma x^2$$
$$\Sigma xy = a\Sigma x + b\Sigma x^2 + c\Sigma x^3$$
$$\Sigma x^2 y = a\Sigma x^2 + b\Sigma x^3 + c\Sigma x^4$$

3) Ceifficieul of Co-relation

i) <u>Direct Method</u>:

$$r = \frac{n\Sigma xy - (\Sigma x).(\Sigma y)}{\sqrt{[n\Sigma x^2 - (\Sigma x)^2][n\Sigma y^2 - (\Sigma y)^2]}}$$

ii) Karl pearson coeffieut of co-relation

$$\boxed{r = \frac{\mathrm{cor}(x, y)}{\sigma x . \sigma y}}$$

$$\bar{x} = \frac{\Sigma x}{N}, \quad \bar{y} = \frac{\Sigma y}{N}$$

where, $\mathrm{cor}(x, y) = \frac{\Sigma xy}{n} - \bar{x}.\bar{y}$

$$\sigma x = \sqrt{\frac{\Sigma x^2}{N} - (\bar{x})^2}$$

$$\sigma y = \sqrt{\frac{\Sigma y^2 - (\bar{y})^2}{N}}$$

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iii) Spearman's Rank co-relation

$$R = 1 - \frac{6\sum d^2}{n^3 - n}$$

4] Regrassion of line :

i) regrassion of x on y

$$(x - \bar{x}) = b_{xy}(y - \bar{y})$$

where, $b_{xy} = r \cdot \frac{\sigma x}{\sigma y}$

$$r = \frac{\text{cov}(x, y)}{\sigma x \cdot \sigma y}$$

ii) regrassion of y on x

$$(y - \bar{y}) = b_{yx}(x - \bar{x})$$

where,

$$b_{yx} = ~~cov~~\ r \cdot \frac{\sigma y}{\sigma x}$$

$$r = \frac{\text{cov}(x, y)}{\sigma x \cdot \sigma y}$$

5] Quartile Deviation

$$\frac{Q_3 - Q_1}{2}$$

- coefficient of quartile deviation

$$\frac{Q_3 - Q_1}{Q_3 + Q_1}$$

$Q_1 = \left(\frac{n+1}{4}\right)^{th}$ observation , $Q_3 = 3\left(\frac{n+1}{4}\right)^{th}$ observation

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* Deciles :

$D_1 = \left(\frac{N}{10}\right)^{th}$, $D_2 = \left(\frac{2N}{10}\right)^{th}$, $D_7 = \left(\frac{7N}{10}\right)^{th}$

$D_1 = l + \left(\frac{N/10 - fc}{fm}\right) \times h$, $D_2 = l + \left(\frac{N/5 - fc}{fm}\right) \times h$

$D_7 = l + \left(\frac{7N/10 - fc}{fm}\right)$

* Percentile :

$P_1 = \left(\frac{N}{100}\right)^{th}$, $P_2 = \left(\frac{2N}{100}\right)^{th}$, $P_{35} = \left(\frac{35N}{100}\right)^{th}$

$P_1 = l + \left(\frac{N/100 - fc}{fm}\right) \times h$, $P_2 = l + \left(\frac{2N/100 - fc}{fm}\right) \times h$

$P_{35} = l + \left(\frac{35N/100 - fc}{fm}\right) \times h$

6) Measure of skewness :

i) Karl Piorson coefficient of skewness

$$Sk = \frac{\text{mean} - \text{mode}}{S.D.}$$

or

$$Sk = \frac{3\text{mean} - 3\text{median}}{S.D.}$$

$\text{Mode} = l + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right) \times h$

$\text{median} = l + \left(\frac{N/2 - fc}{fm}\right) \times h$

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7) Bowlays coefficient of skewness:

$$S\beta = \frac{Q_3 + Q_1 - 2M}{Q_3 - Q_1}$$

Q_3 = 3rd Q.D.
Q_1 = 1st Q.D.
M = Median.

8] Kurtosis:

$$\beta_2 = \frac{\mu_4}{(\mu_2)^2}$$

overmbs

where, $\mu_1 = \frac{\Sigma fd}{N} = 0$ where $d = x - \bar{x}$

$\bar{x}$ = mean

$\mu_2 = \frac{\Sigma fd^2}{N}$ mean $= \frac{\Sigma x}{N}$

$\mu_3 = \frac{\Sigma fd^3}{N}$ leptokurtic ($\beta_2 > 3$)

Mesokurtic ($\beta_2 = 3$)

$\mu_4 = \frac{\Sigma fd^4}{N}$ Platykurtic ($\beta_2 < 3$)

9) Harmonic Mean

$$HM = \frac{N}{\Sigma\left(\frac{1}{x_i}\right)}$$

If frequency is given:

$$HM = \frac{N}{\Sigma f\left(\frac{1}{x_i}\right)}$$

10] Geometric Mean

~~GM~~ =

If $x_1, x_2, \dots x_n$ are the observations, then

$$G.M. = \sqrt[n]{x_1 \times x_2 \times \dots x_n}$$

or

$$G.M. = (x_1 \times x_2 \times \dots x_n)^{\frac{1}{n}}$$

11] Combine Harmonic Mean