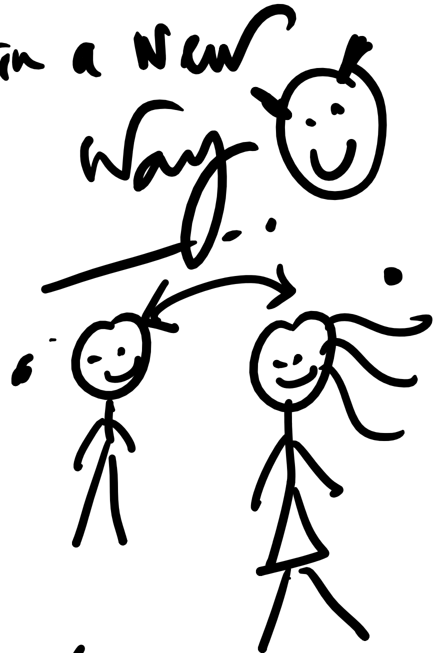
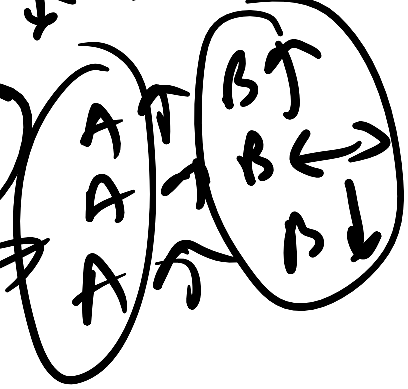
Correlation in a New Way

(A) ↑ (B) ↑ ↓ ↔



Parameters The

Interests



$\sigma \to$ SD $\quad \sigma^2$ var

Cov X, Y $\pm$??

How Correlation can be defined by B D'Souza

9862395723

$\sigma \to$ Actual - Expected

Rule

$\sigma_{x+y} > \sigma_{x-y}$ +ve

$\sigma_{x+y} < \sigma_{x-y}$ −ve

$$\frac{Cov(x,y)}{\sigma_x \cdot \sigma_y} = r(x,y)$$

$Var(x+y) = V(x) + V(y) - 2\,Cov(x,y).$

$\Rightarrow \sigma^2_{x+y} = \sigma^2_x + \sigma^2_y \pm 2r\,\sigma_x\sigma_y$

$\sigma^2_{x-y} = \sigma_x^2 + \sigma_y^2 - 2r\,\sigma_x\sigma_y$

$\sigma^2_{x+y} - \sigma^2_{x-y} = 4r\,\sigma_x\sigma_y$

$\sigma^2_{x+y} - \sigma^2_{x-y}$

$\sigma^2_{x+y} - \sigma^2_{x-y} = 4 r \sigma_x \sigma_y$

$$r = \frac{\sigma^2_{x+y} - \sigma^2_{x-y}}{4\sigma_x \sigma_y}$$

[illegible]

$\boxed{r > 0}$

$\sigma^2_{x+y} - \sigma^2_{x-y} > 0$

$\boxed{\sigma_{x+y} > \sigma_{x-y}}$

Chng of origin and scale $\to 0$

(+) (−)   (×) (÷)

$\Delta_0 \gtrless \Delta_s$

Gym

1 year

Variance

300

Theory of Chapters

The entire weekend of Thursday in depth to a statistic (2)

[illegible]

BARD X

Guide X

Summary XXX

Brainstorm

Opentimes 2 Items

Current exam system

Variable

[illegible]

Constant

(X) (Y)

$\mu = 0$

9   12

(X, Y) $\quad \mu$ $\quad 9 \quad 12$

SD1 $\quad$ SD2

If $X+2Y$ & $kX-Y$ are uncorrelated then find k ??

$r(X,Y)=0$ $\quad Cov(X,Y)=0$

$U = X+2Y$ $\quad r(U,V)=0$ $\quad Cov(U,V)=0$

$V = kX-Y$

$Cov(U,V) = k\,Var(X) - Cov(X,Y) + 2k\,Cov(Y,X) - 2\,Var(Y)$

$= 81k - 2\cdot 144$

$= 81k - 288 = 0$ $\quad k = \frac{288}{81} = \frac{32}{9}$

Centroid Algorithm

$X_i\ (i=1,2,3)$ uncorrelated $\quad \sigma_1, \sigma_2, \sigma_3$

find Corr (X_1+X_2) & (X_2+X_3) — (I) Hw

$X_1+X_2+X_3$ & X_2+X_3 — (II)

$\sum X_i$ & X_1+X_3 — (III)

Trans

$\xi = X\cos\theta + Y\sin\theta$

$\eta = Y\cos\theta - X\sin\theta$

ξ ... are independent

find θ → ξ and η are independent ..

$$Cov = E\left[\left\{\xi - E(\xi)\right\}\left\{\eta - E(\eta)\right\}\right]$$

ξ → $\underline{X_i}$

Notation: usual notations — eta

$\alpha, \beta, \gamma, \Sigma,$

X → chi (

X → chi (

All greek letters

τ → tau

ζ zeta

$\phi \quad \psi \quad \xi \quad \varepsilon$

$$= \cos^2\theta \cdot Cov(x,y) - \sin\theta\cos\theta \cdot \sigma_x^2 + \sin\theta\cos\theta\, \sigma_y^2 - \sin^2\theta\, Cov(x,y)$$

$$= (\cos^2\theta - \sin^2\theta)(Cov(x,y)) - \sin\theta\cos\theta\,(\sigma_x^2 - \sigma_y^2) = 0$$

If ξ, η are independent ?? → uncorrelated

$$Cov(\xi, \eta) = 0$$

$$(\cos^2\theta - \sin^2\theta)\, Cov(x,y) - \sin\theta\cos\theta(\sigma_x^2 - \sigma_y^2) = 0$$

$$\cos 2\theta \cdot r \cdot \sigma_x \sigma_y = \frac{1}{2}\sin 2\theta\, (\sigma_x^2 - \sigma_y^2)$$

$$\tan 2\theta = \left(\frac{2r\sigma_x\sigma_y}{\sigma_x^2 - \sigma_y^2}\right)$$

$$\theta = \frac{1}{2}\left[\tan^{-1} \cdot \frac{2r\sigma_x \cdot \sigma_y}{\ldots}\right]$$

$$\theta = \frac{1}{2}\left[\tan^{-1}\cdot\frac{2r\,\sigma_x\cdot\sigma_y}{\sigma_x^2-\sigma_y^2}\right]$$

A C om

Nepal
Myanmar
Bhutan

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Why Coin using are falling??
($\pi \to$ inflation)

If X, Y denote the random number Heads & Tails $r(X,Y) = ??$

n times its tossed

$$\boxed{X+Y=n}$$

$$Y = (n-X)$$

$$\therefore r(X,Y) = r(X, n-X) = r(X, -X) = -r(X,X)$$

$$\Rightarrow -1$$

Question: X_1, X_2, X_3 3 variables each with var $\to \sigma^2$ Correlation $\to r$ the $\mathrm{var}(\bar{X}) = ?$

If $\bar{X} = \dfrac{X_1+X_2+X_3}{3}$

Ans: $v(x_1) = v(x_2) = v(x_3) = \sigma^2$ $\quad r(x_1, x_2) = r(x_2, x_3) = r(x_1, x_3) = r$

$\bar{X} = \frac{1}{3}(x_1 + x_2 + x_3)$

$\mathrm{Var}(\bar{X}) = \frac{1}{9}\left[v(x_1) + v(x_2) + v(x_3) + 2\,\mathrm{Cov}(x_1, x_2) + 2\,\mathrm{Cov}(x_1, x_3)\right.$

$$Var(\bar{X}) = \frac{1}{9}\left[V(X_1) + V(X_2) + V(X_3) + 2Cov(X_1, X_2) + 2Cov(X_1, X_3) + 2Cov(X_2 X_3) \right]$$

$$= \frac{1}{9}\left[\sigma^2 + \sigma^2 + \sigma^2 + 2\gamma\left(\sigma_{X_1}\sigma_{X_2} + \sigma_{X_2}\sigma_{X_3} + \sigma_{X_1}\sigma_{X_3} \right) \right]$$

$$= \frac{1}{9}\left[3\sigma^2 + 2\gamma \cdot 3\sigma^2 \right]$$

$$= \frac{\sigma^2}{3}(1 + 2\gamma)$$

$Var(\bar{X}) \geq 0$ $\Rightarrow$ $\frac{\sigma^2}{3}(1 + 2\gamma) \geq 0$

$\boxed{\gamma \geq -\frac{1}{2}}$

$\sigma^2 > 0$

Case of exponential distribution λ

n no of obs^n $(0, \frac{1}{\lambda}), (1/\lambda, 2/\lambda)$

$\rho(X, Y) = ??$

Ans: $p_1, p_2 \longrightarrow Exp(\lambda)$ lies in $(0, \frac{1}{\lambda}), (1/\lambda, 2/\lambda)$

$$p_1 = \int_0^{1/\lambda} \lambda e^{-\lambda x}\, dx = \lambda \left| \frac{e^{-\lambda x}}{-\lambda} \right|_0^{1/\lambda} = 1 - e^{-1} = \frac{e-1}{e}$$

$$p_2 = \int_{1/\lambda}^{2/\lambda} \lambda e^{-\lambda x}\, dx = \lambda \left| \frac{e^{-\lambda x}}{-\lambda} \right|_{1/\lambda}^{2/\lambda} = e^{-1} - e^{-2} = \frac{e-1}{e^2}$$

$$\rho_{XY} = -\left[\frac{p_1 p_2}{(1-p_1)(1-p_2)} \right]^{1/2}$$

$$= -\left(e - 1 \right.$$

$$= -\left(\frac{e-1}{\sqrt{e^2-e+1}}\right)$$

Next: More ~~Geometric~~ Contributions with Advanced Requirements.