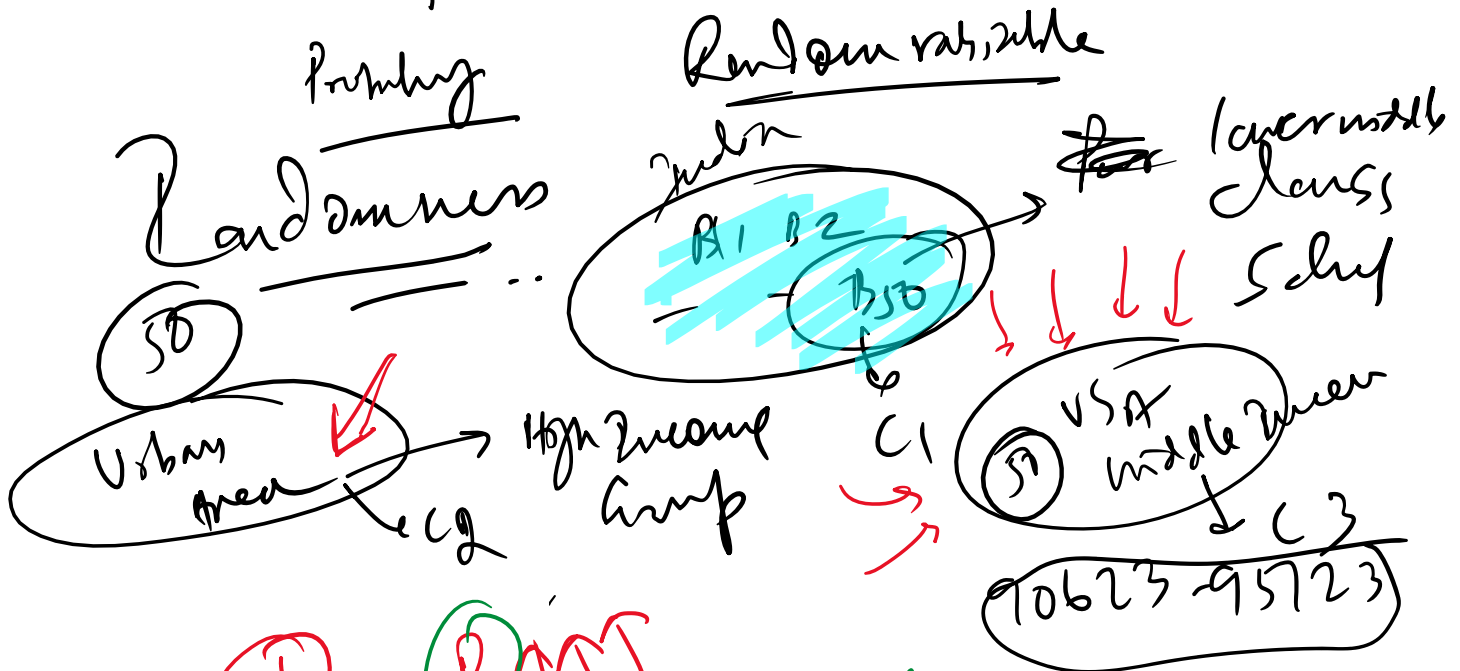


STATISTICS



#

P

Success Rate is higher

changing P X

Normal

Binomial

Instances

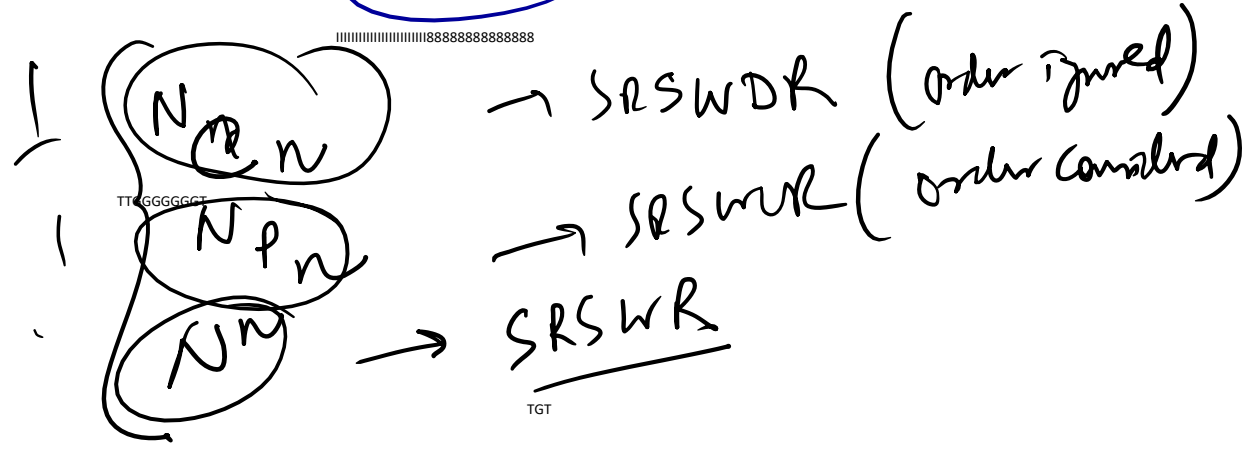
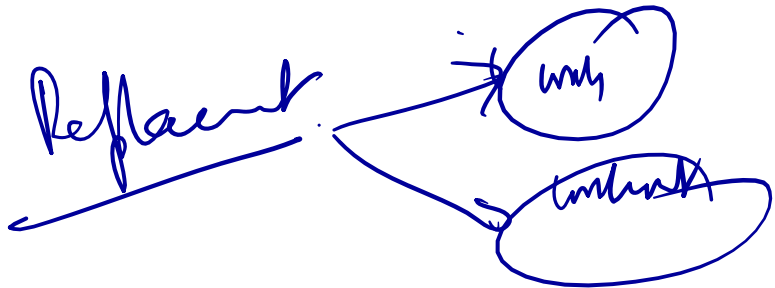
- Level of Selection procedures
- ① Integration ∫ ∫ ∫
 - ② Partial derivative
 - ③ Differentiation
 - ④ Matrix + Determinant
 - ⑤ Beta & Gamma Functions

CR quadratic function

$$f(x) = \alpha x^2 + \beta x + \gamma$$

← 120

SR simple random sampling $P = \dots$ (1/20)
 CR with constraint \rightarrow CR
 without $n \rightarrow$ CR



Random gates

$X \rightarrow \underline{U(0,2)}$ $f_X(x) = \begin{cases} 1/2 & 0 \leq x \leq 2 \\ 0 & \text{elsewhere} \end{cases}$
 $E(|X - E(X)|)$
 $E(X) = \int_0^2 x \cdot \frac{1}{2} dx = \left. \frac{x^2}{6} \right|_0^2 = \frac{4}{3}$

$$E(x) = \int_0^2 x \cdot x^{1/2} dx = \left(\frac{x^{3/2}}{3/2} \right) \Big|_0^2 = \frac{2\sqrt{2}}{3}$$

$$E\left(\frac{1}{x} - E(x)\right) = E\left(x^{-4/3}\right) = \int_0^{4/3} (-x + 4/3) x^{1/2} dx + \int_0^2 (x - 4/3) x^{1/2} dx$$

$$= \left(-\frac{x^{3/2}}{3/2} + \frac{x^{3/2}}{3} \right) \Big|_0^{4/3} + \left(\frac{x^{3/2}}{3/2} - \frac{x^{3/2}}{3} \right) \Big|_0^2$$

$f_x(x) = a e^{-x}$ $x > 0$

find the value of fm to 2nd moment

$$\int_0^{\infty} x^{r-1} e^{-x} dx$$

$r = 0, -1, -2, \dots$
 $n = 1, 2, \dots \quad \Gamma(n) = (n-1)!$

$\Gamma(2) = 1 = \int_0^{\infty} x e^{-x} dx$

$E(x) = \int_0^{\infty} a \cdot x e^{-x} dx = \int_0^{\infty} x^2 e^{-x} dx = \Gamma(3) = 2! = 2$

$E(x^2) = \int_0^{\infty} n^2 x e^{-x} dx = \int_0^{\infty} x^3 e^{-x} dx = \Gamma(4) = 3! = 6$

$n < 30$ Γ $n > 30$ Γ $\rightarrow \Gamma$

A box 10 white 15 blue

X, white marbles in a selection of 10 marbles
 \dots $\Gamma(x)$ Γ

X, white numbers without replacement.

$$\frac{\text{var}(X)}{E(X)}$$

??

Hypergeometric

Finite Population

Carbs (1)
Cals (2)

→ substitue

without replacement

- ① Finite population
- ② 2 for
- ③ total
- ④ WOR

Uniform

All outcomes are equally likely
P density is same

9862395723

$M = 25$ $K = 10$ $n = 10$

$E(X) = \frac{nK}{M} = 4$

$V(X) = \frac{nK(M-K)(M-n)}{M^2(M-1)} = 3/2$

$\frac{V(X)}{E(X)} = \frac{3/2}{4} = 3/8$

~~#~~

(X)

CV

$f(x) = \frac{1}{\sqrt{2\pi}} e^{-x^2/2}$

$E[X | X > 0]$

$$E[X | X > 0]$$

$$X \rightarrow \underline{N(0,1)}$$

So, the density function of the conditional distribution

$$f(x | X \geq 0) = \frac{f(x)}{P(X > 0)} = \frac{f(x)}{1/2} = 2f(x)$$

the conditional expectation is

$$\begin{aligned} \int_0^{\infty} x f(x | X > 0) dx &= \int_0^{\infty} 2x \frac{1}{\sqrt{2\pi}} e^{-x^2/2} dx \\ &= -\frac{2}{\sqrt{2\pi}} e^{-x^2/2} \Big|_{x=0}^{x=\infty} = \frac{2}{\sqrt{2\pi}} = \frac{\sqrt{2}}{\sqrt{\pi}} \end{aligned}$$

X, Y

$$f_T(t) = \frac{1}{2a} \quad -a < t < a$$

$$= 0, \quad \text{otherwise}$$

$$\text{Var}(XY) = \frac{64}{9} \text{ find } a = ?$$

X, Y both have Uniform distribution $(-a, a)$

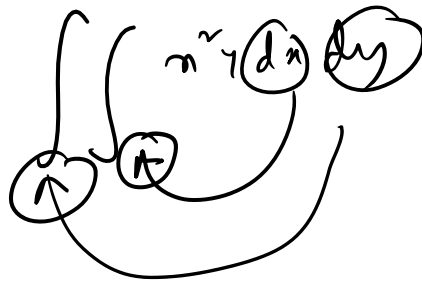
$$\begin{aligned} \frac{64}{9} &= \text{Var}(XY) = E[(XY)^2] - (E(XY))^2 \\ &= E(X^2)E(Y^2) - (E(XY))^2 \\ &= \left(\frac{a^3 - (-a)^3}{12} + 0^2 \right) - 0^2 = \frac{a^3}{9} \end{aligned}$$

$$a^3 = 64 \quad a = \sqrt[3]{64} = 4$$

$$Q^4 = 64 \quad Q = (\sqrt[4]{64}) = 2\sqrt{2}$$

Proceed with

$$V(x, y) = \int_a^b \int_c^d f(x, y) \, dx \, dy$$



inside	inside
outside	outside