Lec 1

Sample

Population

Subset

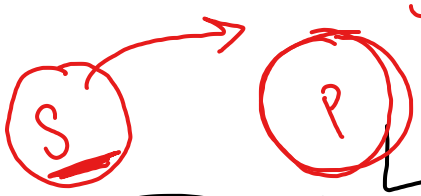
↳ people

↳ products

↳ Shelter

Statistics

Inferential stat.



parameters

↳ limited Resources

↳ Time

↳ Damage

Statistic

Sample mean $\bar{x}$

$* \bar{x} = \frac{\sum x_i}{n}$

population

pop. mean μ

$* \mu = \frac{\sum x_i}{N}$ ✓

$* \hat{p}$ $\frac{x}{n}$

p proportion $\frac{x}{N}$

Dispersion

$* S^2 = \frac{\sum (x_i - \bar{x})^2}{n-1}$

$S = \sqrt{\frac{\sum (x_i - \bar{x})^2}{n-1}}$

$* \omega^2$ Variance

$\omega^2 = \frac{\sum (x_i - \mu)^2}{N}$

$\omega = \sqrt{\frac{\sum (x_i - \mu)^2}{N}}$

* Random Sample : No specific pattern that leads to biasness.

→ Central tendency:

* $\bar{x} = \frac{\sum x_i}{n}$

* mode = the most frequent

* median = middle value.

· Sampling Distribution

Sample

$\bar{x}$

S^2

S

Ex

100

$\bar{x} = 95$

100

90

$\bar{x}$

100

$\bar{x}$ 85

60

$\bar{x}$

x^0

$\bar{x} \rightarrow$ r.v

$\bar{x} \sim$ Dist.

$p(\bar{x} > \quad)$

$\bar{x} \sim N(\mu, \frac{\sigma}{\sqrt{n}})$

$x \sim N$

CLT
Central limit Theorem.

$n \geq 30$

$\mu_{\bar{x}} = \mu_x$

$\sigma_{\bar{x}} = \frac{\sigma_x}{\sqrt{n}}$

$\sigma^2_{\bar{x}} = \frac{\sigma^2_x}{n}$

Ex

$p(\bar{x} \geq 5.027) =$

$n = 100$ using CLT

$\bar{x} \sim N(5, \frac{0.1}{\sqrt{100}})$

$p(Z \geq \frac{5.027 - 5}{\frac{0.1}{\sqrt{100}}}) = 1 - 0.9965 =$

$= 0.0035$

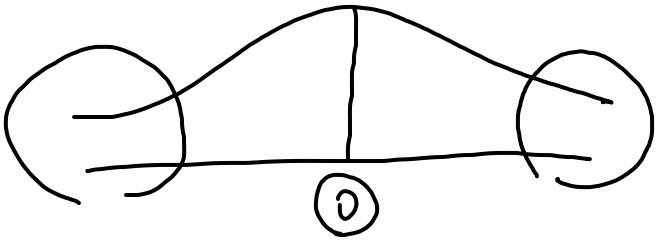
✓ σ known $\longrightarrow$ $p(\bar{x} \sim N(\mu_{\bar{x}}, \frac{\sigma_x}{\sqrt{n}})$

$Z_c = \frac{\bar{x} - \mu}{\sigma/\sqrt{n}} \sim Z$

✓ σ unknow $\longrightarrow$ $p(\bar{x} \sim t(\mu, \frac{S}{\sqrt{n}})$

$t_c = \frac{\bar{x} - \mu}{S/\sqrt{n}} \sim t$

* t - dist



Symmetric

mean = mode = median = 0

tails are thicker than the normal

$t_{\alpha, df} = (n-1)$