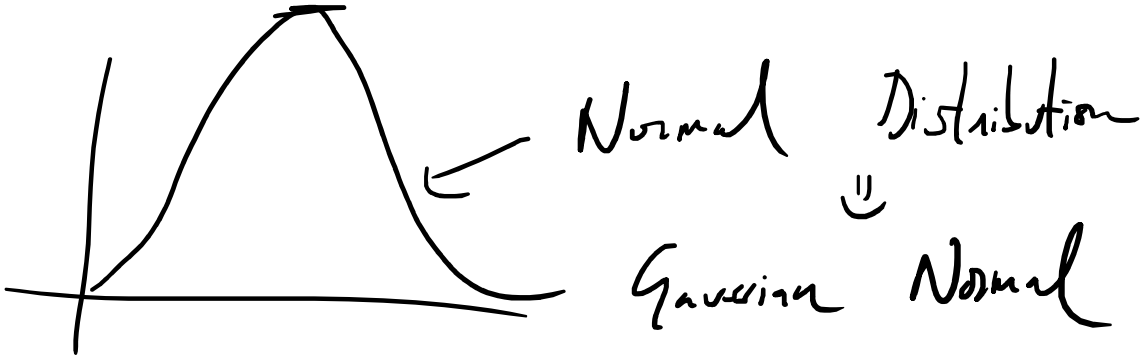
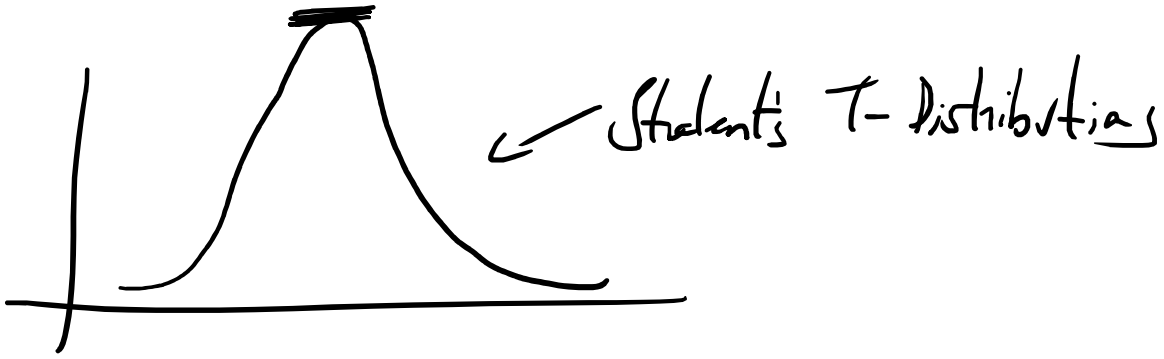
2025-07-18 Analyze the data and perform interval testing for sampling distributions.

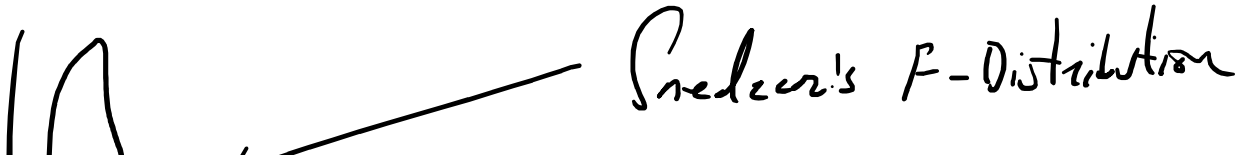
18 July 2025 16:30

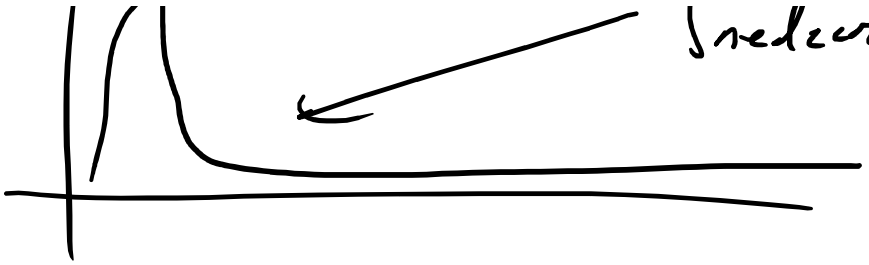
=> Sampling & Statistical Inference :

=> Distributions :









⇒ Mean, S.D & Variance

-> Sampling Distribution of Mean

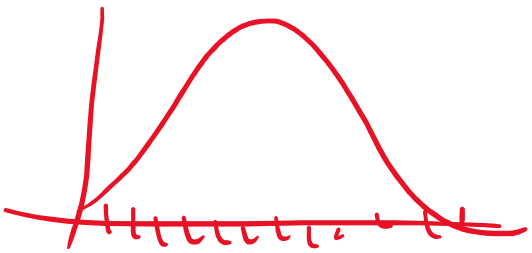
-> Population $\mu_{\bar{x}} = \mu$

-> Sample $\sigma = \sigma_{\bar{x}} \sqrt{n}$

-> The size of sample needs to be more than 30.

⇒ Unit Normal Distribution:

$N(0, 1)$



$$z = \frac{\bar{x} - \mu}{\sigma / \sqrt{n}}$$

-> Case 1 : Standard Deviation is not known

-> Case 2 : Sample size is small ($n \leq 30$)

↳ Student's T- Distribution :

$$t = \frac{\bar{x} - \mu}{s / \sqrt{n}}$$

where $$s^2 = \frac{1}{n-1} \sum_{i=1}^{n} (x_i - \bar{x})^2$$

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

⇒ Interval Estimation :

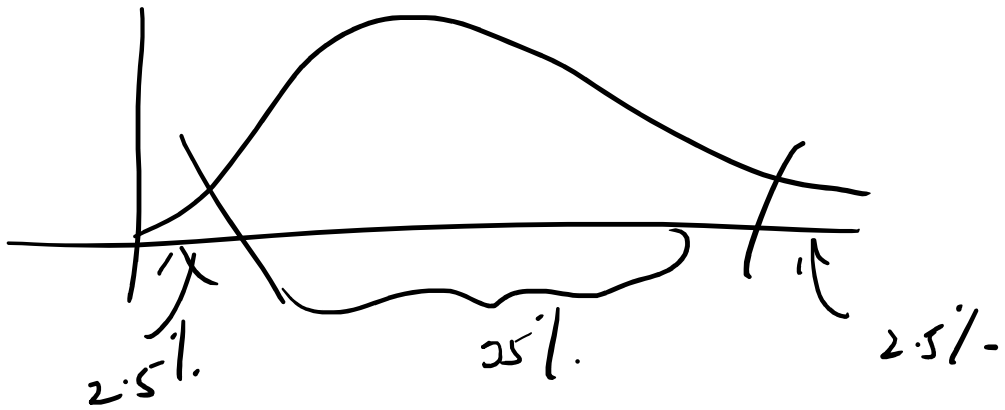
-> Sample Mean : $\bar{x} = \frac{1}{n} \sum_{i=1}^{n} x_i = \frac{\sigma}{\sqrt{n}}$

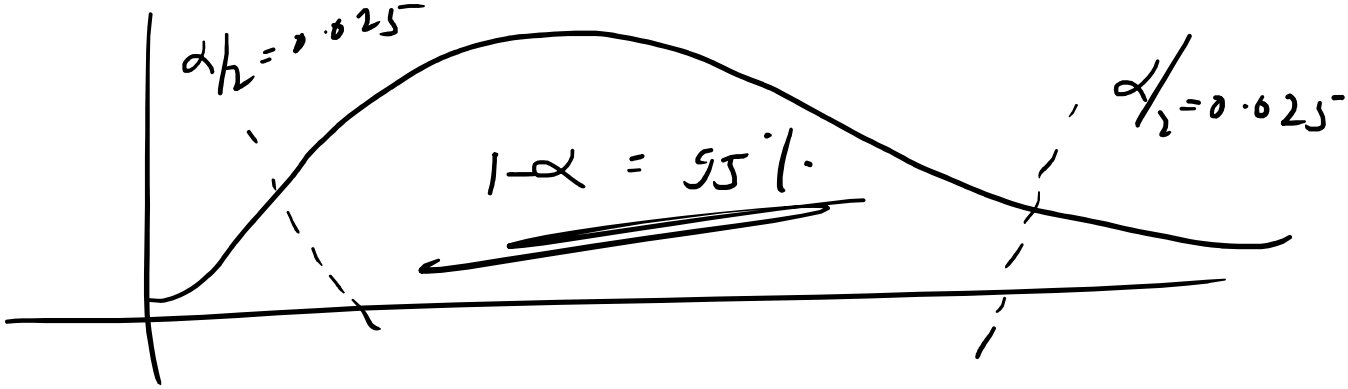
-> Standard Error

=> Estimating Population Mean μ (σ is known)

-> Confidence Co-efficient (Arbitrary)

Confidence => Prediction





$\alpha = 0.05$

-> Conf Levels	Conf Co-effs	α	Critical Value
80%	0.8	0.2	1.28

90%	0.9	0.1	1.645
95%	0.95	0.05	1.96
98%	0.98	0.02	2.33

⇒ Confidence Interval Estimate :

$$\left(\bar{x} - z_{\alpha/2} \times \frac{\sigma}{\sqrt{n}} \;,\; \bar{x} + z_{\alpha/2} \times \frac{\sigma}{\sqrt{n}} \right)$$

Confidence Estimate

Standard Error