① Central Limit Theorem

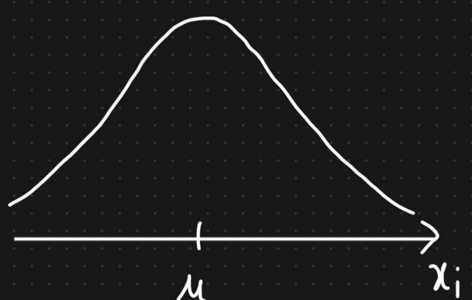
The central limit theorem relies on the concept of a sampling distribution, which is the probability distribution of a statistic for a large number of samples taken from a population.

The central limit theorem says that the sampling distribution of the mean will always be normally distributed, as long as the sample size is large enough. Regardless of whether the population has a normal, Poisson, binomial, or any other distribution, the sampling distribution of the mean will be normal.

n = Sample size $\Rightarrow$ any value

① $X \approx N(\mu, \sigma)$

Population DATA



$S_1 = \{x_1, x_2, x_4 \ldots x_n\} = \bar{x}_1$

$S_2 = \{x_2, x_3 \ldots x_n\} = \bar{x}_2$

S_3 $\quad \bar{x}_3$

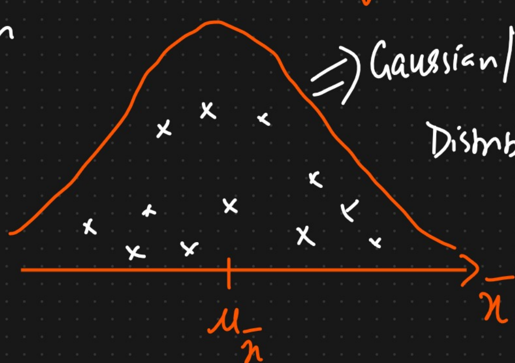
S_4

$\vdots$

S_m $\quad \bar{x}_m$

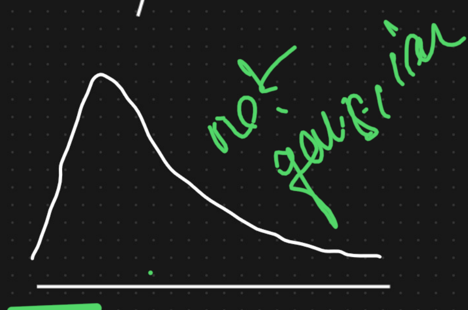
$\Downarrow$ $\boxed{CLT}$

Sampling distribution of the mean



$\Rightarrow$ Gaussian/Normal Distribution

② $X \not\approx N(\mu, \sigma)$



$\Rightarrow$ $\boxed{n \geq 30}$ $\Rightarrow$ sample size

S_1 $\quad \bar{x}_1$

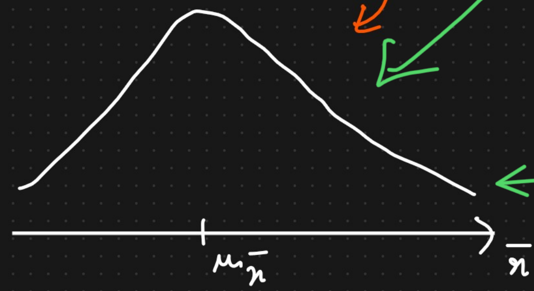
S_2 $\quad \bar{x}_2$

$n \geq 30$

$\vdots$

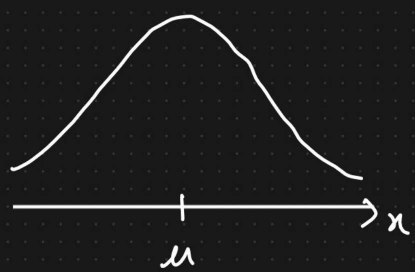
$\bar{x}_m$

$\Downarrow$ $\boxed{CLT}$



not gaussian but $n \geq 30$ then also

① Normal Distribution

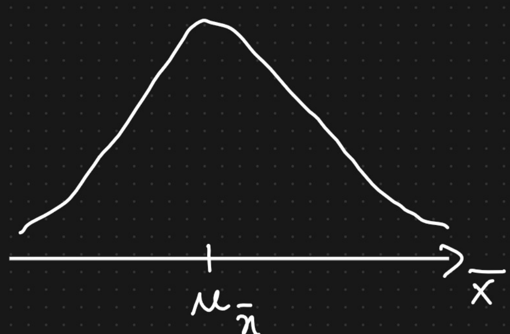


$X \sim N(\mu, \sigma)$

⇓

Sampling Distribution of mean

from data which is normally distributed



σ = population std

μ = population mean

n: sample size

$$X \sim N\left(\mu, \frac{\sigma}{\sqrt{n}}\right)$$