

Topic 7a Sampling Distributions of Sample Means

Statistical Inference Basic

1. Random Variables X_1, X_2, \dots, X_n form a simple random sample of size n if
 - The X_i 's are independent random variables.
 - Every X_i has the same probability distribution.
2. Central Limit Theorem when independent random variables are added, their properly normalized sum tends toward a normal distribution (informally a bell curve) even if the original variables themselves are not normally distributed.
3. The Law of Large Numbers As the sample size increases, the sample mean gets closer to the population mean. That is, the difference between the sample mean and the population mean tends to become smaller (i.e., approaches zero).

Topic 7b Sampling Distributions

Binomial Probability Distribution

1. Expected Value and Variance

Expected value: $E(X) = \mu = np$

Variance: $V(X) = npq = np(1 - p)$

Standard Deviation: $\sigma_x = \sqrt{npq} = \sqrt{np(1 - p)}$

Standard Error: $\sqrt{pq/n}$

Sampling Distribution

- population parameter = μ
- point estimate = sample mean = \bar{x}
- standard error = $\sigma(\bar{x}) = \frac{\sigma_x}{\sqrt{n}}$