Lecture-21

Probability & Statistics.

Classtest – Syllabus (from Hines's book)

- Chapter-4 (all)
- chapter-5 (5.3, 5.8)
- chapter-6 (all)
- chapter-7 (all)

Doubt-clearing session: April 05, 2017
5 – 6:30 pm
Maths dept., N303.

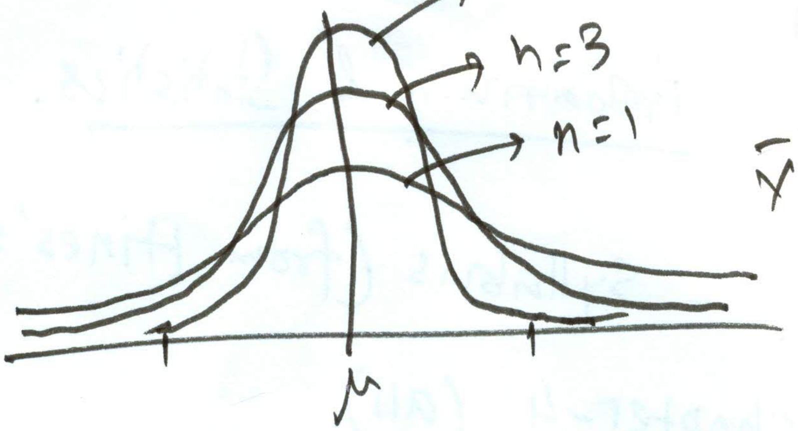
'not known' $\left[\begin{array}{l}\mu - \text{population mean} \\ \sigma^2 - \text{population variance}\end{array}\right.$

Sample: $X_1, X_2, \ldots, X_n$ i.i.d.
'n' ≥ 30 (from experience)

Statistic
- → Sample mean $\bar{X} = \frac{1}{n}(X_1 + X_2 + \cdots + X_n)$
  $\bar{X} \sim N(\mu, \sigma^2/n)$
  (using CLT)
- → Sample variance

$$S^2 = \frac{\sum_{i=1}^{n}(X_i - \bar{X})^2}{n-1}$$

$$E(S^2) = \sigma^2$$



$\bar{X} \sim N(\mu, \sigma^2/n)$

Sampling distributions from a normal population.

Known: Let $X_1, \ldots, X_n$ be a sample from a normal population having mean μ, variance σ^2.

$$X_i \sim N(\mu, \sigma^2), \quad i = 1, 2, \ldots n.$$

Distribution of sample mean

$$\bar{X} \sim N(\mu, \sigma^2/n).$$

Without using CLT.

$$E[\bar{X}] = E\left[\frac{X_1 + \cdots + X_n}{n}\right] = \mu$$

$$Var(\bar{X}) = var\left(\frac{X_1 + \cdots + X_n}{n}\right)$$

$$= \frac{1}{n^2}\left[var(X_1) + \cdots + var(X_n)\right]$$

$$= \sigma^2/n.$$