Summary

- Central Limit Theorem not only gives the method for approximating the distribution of the sum of the R.Vs but also it helps to obtain remarkable facts that the empirical frequencies of so many naturally occurring populations exhibit a bell shaped (that is normal) curve
- The CLT also partially explains why many data sets related to biological characteristics tend to be approximately Normal
- Lyapunov's theorem given in 1901 is the first turning point for the Central Limit problem
- The next significant step in this direction came in 1922, when Linderberg gave the sufficient condition which was later in 1945 shown necessary by Feller too
- It is the Linderberg-Feller Theorem which makes the statement of CLT precise in providing the sufficient and necessary Lindeberg condition whose satisfaction accounts for the ubiquitous appearance of the bell shaped normal
- According to Linderberg-Levy Theorem, Let {Xk} be the sequence of independent and identically distributed random variables with $E(X_k)=\mu$ and $V(X_k) = \sigma^2$ which is finite , then

  $\sum_{k=1}^{n} \frac{(Xi-\mu)}{\sigma\sqrt{n}}$ is asymptotically Normal with mean 0 and variance 1

- According to Linderberg Feller, if the random variates X_1, X_2, ... satisfy the Lindeberg condition, then for all a < b ,

  $\lim_{n\to\infty} P\left(a < \frac{Sn - E(Sn)}{s_n} < b \right) = \Phi(b) - \Phi(a)$ where Φ is the Normal distribution function

- The mean of all samples within that universe of numbers will be roughly the mean of the whole sample
- In essence, the Central Limit Theorem states that the normal distribution applies whenever one is approximating probabilities for a quantity, which is a sum of many independent contributions all of which are roughly the same size