* Bernoulli(P) को limiting distribution ($Y_n = \sum X_i$) mgf technique बाट गर्दा हो भने mgf of poisson distribution को mgf दिन्छ।

* $G_n(y)$ as $n \to \infty$ $G(y)$ आउछ र त्यो $G(y)$ always 0 आउछ भने that is not a valid CDF so the limiting distribution does not exist.

Eg. $G_n(y) = \left(1 - \frac{1}{y^2}\right)^n$ $\qquad \left(1 - \frac{1}{y^2}\right)^n < 1$

* Binomial को CDF को closed form हुदैन

Binomial distribution को mean $\mu = np$ र variance $\sigma^2 = npq$.

* Bernoulli(P) $\cong$ BIN(1,P) हुन्छ र Binomial को limiting distribution निकाल्दा हो भने त्यो poission(μ) आउछ (by mgf technique).

* central limit theorem भनेको approximation को लागि use गर्ने हो।

* central limit theorem says हामीलाई जुनसुकै distribution दिएको हुन पनि थाहा पर्दैन but we only need to know their mean र variance, यदि त्यो थाह छ भने, we can approximate it by using normal distribution.

* $\bar{\mu} \rightarrow$ mean $\qquad \bar{X}_n \rightarrow$ sample mean

$Z \rightarrow \frac{\bar{X} - \mu}{\sigma} \qquad \frac{\bar{X} - \mu}{\sigma / \sqrt{n}}$

* X & Y are given random variable of some (given) distribution & U & V चाहिँ function of X & Y छ। If we have to calculate the joint pdf of U & V, we can use.

$$f_{U,V}(u,v) = f_{X,Y}(x,y)\,|J| \qquad \begin{vmatrix} \frac{\partial X}{\partial u} & \frac{\partial X}{\partial v} \\ \frac{\partial Y}{\partial u} & \frac{\partial Y}{\partial v} \end{vmatrix} = |J|$$

* Limiting distributions find out गर्ने question मा यदि pdf दिएको छ भने, integrate गरेर CDF calculate गर्ने।

* यदि X and Y indep छन भने तिनीहरूको joint pdf $f_{X,Y}(x,y)=f_X(x)\cdot f_Y(y)$ हुन्छ।

* $L = X_1 + X_2 + \dots + X_n$ हो & If $X_1, X_2, \dots, X_n$ हरु iid छन भने

Mgf of L:

$$M_L(t) = M_{X_1}(t)\cdot M_{X_2}(t)\cdots M_{X_n}(t)$$ लेख्न मिल्छ।

i.e यदि independent छन भने mgf हरुलाई product मा लेख्न मिल्छ।

* Smallest order statistics कुनै number भन्दा सानो छ भने त्यसले कुनै information दिँदैन

* Smallest order statistic कुनै number भन्दा ठुलो छ भने सबै number त्यो भन्दा ठुलो हुनेछन्।

* largest order statistics कुनै number भन्दा सानो छ भने, सबै random variable त्यो number भन्दा सानो हुनेछन्।

* CLT use गर्नु छ भने finite mean & variance चाहिँ चाहिन्छ।

* In general $n > 30$ भयो भने CLT use गर्न मिल्छ

* यदी random variable $X_1, \dots, X_n$ हरु poision distribute भएका छन् भने तिनिहरुको sum $\Sigma X_i = X_1 + \dots + X_n$ पनि poision नै distribute हुन्छ। we can show this using mgf technique.

* यदी variable हरु independent छन् भने, CDF, Pdf & mgf all लाई product गरी लेख्न मिल्छ।

$$F(x, y) = F(x) \cdot F(y) \longrightarrow \text{CDF}$$

$$f_{X,Y}(x,y) = f_X(x) f_Y(y) \longrightarrow \text{pdf}$$

$$M_{X,Y}(x,y) = M_X(t_1) M_Y(t_2) \rightarrow \text{mgf}$$

* limiting distribution of Y_n find गर्नु छ भने, पहिले CDF of Y_n find गर्ने where Y_n is any function of X_i's. When you got CDF of Y_n, use limit of $n \rightarrow \infty$ it will converge to some function and that's our converging distribution.

* Normal random variable को sum पनि normal नै हुन्छ

* यदी

* Most imp concept

CLT: $X_1, \dots, X_n$ iid from a random sample from a distribution (any) with $E(X_i) = \mu$ and $Var(X_i) = \sigma^2 < \infty$. Then

$$\text{(SUM)} \quad Y_n = \sum_{i=1}^{n} X_i \xrightarrow{d} Y \sim N(n\mu, n\sigma^2)$$

&

$$\text{(sampl mean)} \quad Y_n = \bar{X}_n = \frac{\sum_{i=1}^{n} X_i}{n}$$

$$\boxed{\text{Most Imp}}$$

$$Y_n \xrightarrow{d} Y \sim N\left(\mu, \frac{\sigma^2}{n}\right).$$

* If you read something is "asymptotically normal" it just mean it converges in dist. to a normal dist. (shorthaned basically).

* In order to use CLT, Y_n has to be a sum or a mean.

(ΣX_i) $\quad$ $\left(\frac{\Sigma X_i}{n}\right)$

* only two choice छन् either true हुने or false हुने भन्ने पाइ दुइमध्ये पर्यो की त्यो Binomial distribution हो

* Binomial distribution given छ and If we want to approximate it using CLT, n मात्र हेरेर हुँदैन np and nq पनि हेर्नु पर्छ & them must should be $np>5$ & $nq>5$ to use CLT.

* Our binomial table only goes up to $n=20$ so यदि n, 20 भन्दा माथि छ भने CLT लगाउनु बाहेक अरु कुनै option छैन & n जति ठूलो हुन्छ approximation त्यति नै close हुन्छ

* Binomial को लागि CLT approximation गर्दा भने continuity correction of 0.5 पनि गर्ने।