

Goal: Study the Gramma Distribution

E

Component lifetheses modelling ______ component lifetheses

Gamma Distribution

The gamma function is defined as

$$\Gamma(\alpha) = \int_{0}^{\infty} t^{\alpha-1} e^{\frac{\pi}{2}} dt$$
, for $\alpha > 0$

Proporties of Gamma Function

② [(½)=√m]

For x, B>0, let

$$f(\alpha_1,\alpha_1,\beta) = \begin{cases} \frac{1}{\beta^{\alpha_1} \cdot 7(\alpha)} \cdot x^{\alpha_1 \cdot 1} \cdot e^{-\frac{\alpha_1}{\beta} \beta} & \text{if } x \geqslant 0 \\ 0 & \text{if } x \leqslant 0 \end{cases}$$

Mode: ① $f(x, \alpha, \beta) > 0$ ∀ $x \in \mathbb{R}$ ② $\int_{-\infty}^{\infty} f(x, \alpha, \beta) dx = 1$ (do a Change of Vornables $y = \frac{\pi}{2}$)

We say X has the Gamma Distribution with those parameter α , and scale parameter β if the part of X is $f(x, \alpha, \beta)$.

Note:

O [John B=1] was "Standard Gramma chatribution"

with shape parami of the paramity of the par

(2) $X \sim Gamma(K, B)$ Here (2) $E(X) = M_X = \alpha \cdot B$

 $\beta) \left[\lambda(x) = \Delta^{x} = \alpha \cdot \beta_{x} \right]$

6) Tx = Tx . B

The cdf of $X \sim Gamma(x, p)$ $\overline{f}_{X}(x; x, p) = \begin{cases} \int_{0}^{x} f(t; x, p) dt & \text{if } x > 0 \\ 0 & \text{otherwise} \end{cases}$

 $P(X \in x) = F_x(x; x, \beta) = F\left(\frac{x}{\beta}; x\right)$ cdf of Standard Gammawith param: α . $F(x; \alpha) = \begin{cases} \frac{x}{\beta} + \frac{x}{\beta} & \text{if } x > 0 \\ 0 & \text{otherwise.} \end{cases}$

If Theo Standard Gamma with Shape Derom a

X = BT has Gamma distribution with Shape is

Scale: B

Special Cases of Gamma Distribution

caf. $\int_{X} (\alpha, y) = \begin{cases} 0 & \text{otherwise.} \end{cases}$

Note: $0 \text{ of } \times \text{ has exponential}$ Distribution with param $\lambda > 0$ $\sqrt{(X)} = \sqrt{X^2} = \frac{1}{\lambda^2}$ $\sqrt{X} = \frac{1}{\lambda}$

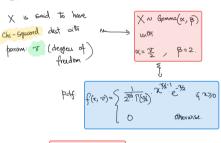
(2) If we have a Roseon The exponential Recent with rate of Machinettes with N=a woodels the distribution of Machinettes of Ma

occurrence of two successive

 That is, if X case modelling the lifetime of a component of the distribution of additional infetume is exactly the same as the original distribution of lifetime.

The exp distribution has monogless property.

@ Chi - Squared Distribution



E(x)=1/x = x.B= v

 $V(x) = a^{-3} = a B_{5} = 5a$

 $\sqrt{\sqrt{2}} = \sqrt{2}$

Note: (1) Chi. square distribution ~ plays important role in statistical inference

(2) If XN N(11,0-2) then $\left(\frac{X-4}{5}\right)^2$ has change distribution with T=1