One-point distribution :

$$P(X=k)=1$$
$$P(X \neq k)=0$$

Mean$(X)=k$ & Var$(X)=0$

Two-point distribution :

$\cancel{P(x_1=}$ $P(X=x_1)=p$ $\quad$ $P(X=x_2)=q$

$p+q=1$

Mean$(X)=px_1+qx_2$ $\quad$ Var$(X)=pq(x_1-x_2)^2$

Bernoulli's dist.

$P(X=1)=p$ $\quad$ $P(X=0)=q$

Mean$(X)=p$ $\quad$ Var$(X)=pq$

Uniform dist.

$P(X=x)=\frac{1}{n}$ $\quad$ Mean$(X)=\frac{n+1}{2}$

Var$(X)=\frac{n^2-1}{12}$

Binomial

$P(X=x) = {}^nC_x p^x q^{n-x}$

$\boxed{\text{Mean} = np}$ $\boxed{\text{Variance} = npq}$

$\boxed{M_0(t) = (q+pe^t)^n}$

$\boxed{\text{Mode} = (n+1)p}$

If (n+1)p is an integer, say k
then 2 modes k & k-1

$(n+1)p \rightarrow$ fraction $\rightarrow \underset{\text{int}}{m} + \underset{\text{fraction}}{f}$

$\therefore$ Mode is m

Prop: • If X_1 is a bin. variate with param. n_1 & p_1 & X_2 is another bin. variate with param. n_2 & p_2 then X_1+X_2 in general is not a Binomial variate.

$$M_{(X_1+X_2)}(t) = M_{X_1}(t) \cdot M_{X_2}(t)$$

$$= (q_1+p_1e^t)^{n_1}(q_2+p_2e^t)^{n_2}$$

• If X_1 & X_2 are 2 binomial variates with param. n_1, p & n_2, p then X_1+X_2 is a bin. variate with param. $(n_1+n_2)p$

$$M_{X_1+X_2}(t) = M_{X_1}(t) \cdot M_{X_2}(t)$$

$= (q+pe^t)^{n_1} (q+pe^t)^{n_2}$

$= (q+pe^t)^{n_1+n_2}$

Poisson Dist:

$n \to \infty, \ p \to 0$

$$P(X=x) = \frac{e^{-m} m^x}{x!}, \quad x = 0, 1, 2 \ldots$$

$\boxed{\text{Mean} = \text{Variance} = m}$

$\boxed{\text{M.G.F.} = e^{m(e^t - 1)}}$

→ If $X_1, X_2 \ldots X_n$ are P independent Poisson variates with param. $m_1, m_2, m_3 \ldots m_n$ then $Y = X_1 + X_2 + \cdots + X_n$ is also a Poisson variate with param. $m_1 + m_2 + m_3 \cdots + m_n$

→ The difference betⁿ 2 Poisson variates isn't a Poisson variate

→ If X_1 & X_2 ~~are~~ are independent Poisson variates with param m_1, m_2 then $Y = a_1X_1 + a_2X_2$ isn't a Poisson variate

Mode:

$$m - 1 \leq x \leq m$$

C-I: If isn't a integer then mode is lies $m-1$ & m

C-II: If m is a integer then there are 2 modes m & $m-1$

Page No.:
Date. / /

Continuous Dist :

→ Rectangular or Uniform Dist. :

$$f(x) = \begin{cases} k & a \leq x \leq b \\ 0 & \text{else where} \end{cases}$$

$$f(x) = \begin{cases} \frac{1}{b-a} & a \leq x \leq b \\ 0 & \text{else where} \end{cases}$$

$$\boxed{\text{Mean} = \frac{b+a}{2}} \qquad \boxed{\text{Variance} = \frac{(b-a)^2}{12}}$$

$$\mu_r' = \int_a^b x^r f(x)\,dx = \int_a^b x^r \times \frac{1}{b-a}\,dx$$

→ Exponential Dist.

$$f(x) = \begin{cases} \lambda e^{-\lambda x}, & x \geq 0 \\ 0, & \text{elsewhere} \end{cases}$$

$\mu_r' =$ Coeff. of $\frac{t^r}{r!}$ in expansion of $M_x(t) = \frac{r!}{\lambda^r}$

$$\boxed{\text{Mean} = \frac{1}{\lambda}} \qquad \boxed{\text{Variance} = \frac{1}{\lambda^2}}$$

Normal dist.

m = mean

σ^2 = variance

$$f(x) = \frac{1}{\sqrt{2\pi} \cdot \sigma} e^{-\frac{1}{2}\left(\frac{x-m}{\sigma}\right)^2} \qquad -\infty < x < \infty$$

$$-\infty < m < \infty$$

Std. normal variate $= \frac{z-m}{\sigma}$

$$\boxed{\text{Mean} = \text{Median} = \text{Mode} = m \qquad \text{Variance} = \sigma^2}$$

~~$M_0(t) = e^{mt+}$~~

$$\boxed{M_0(t) = e^{mt + \frac{t^2\sigma^2}{2}}}$$

Mean deviation (M.D.) $= \frac{4}{5}\sigma$

Quartile deviation (Q.D.) $= \frac{2}{3}\sigma = \frac{Q_3 - Q_1}{2}$

$Q_1 = m - \frac{2}{3}\sigma \qquad Q_3 = m + \frac{2}{3}\sigma$

Hypergeometric

$$P(X=x) = h(x; n, M, N) = \frac{{}^{M}C_x \cdot {}^{N-M}C_{n-x}}{{}^{N}C_n}$$

$$E(X) = np \qquad V(X) = \frac{(N-n)}{(N-1)} np(1-p)$$

$$\text{Corr. factor} = \frac{N-n}{N-1}$$

Geometric

$$f(x) = P(X=x) = pq^{x-1}$$

$$\mu = \frac{1}{p} \qquad \sigma^2 = \frac{q}{p^2}$$