Bernoulli

$$P_X(x) = \begin{cases} p & , x = 1 \\ (1-p) & , x = 0 \end{cases}$$

$$E[X] = p$$

$$var(X) = p(1-p)$$

$$M_X(s) = 1 - p + pe^s$$

Uniform (Descrete)

$$P_X(x) = \frac{1}{b-a+1}$$

$$E[X] = \frac{a+b}{2}$$

$$var(X) = \frac{(b-a)(b-a+2)}{12}$$

$$M_X(x) = \frac{e^{as}(e^{(b-a+1)s} - 1)}{(b-a+1)(e^s-1)}$$

Poisson

$$P_X(x) = e^{-\lambda} \cdot \frac{\lambda^x}{x!} \quad , x = 0, 1, 2 \ldots$$

$$E[X] = \lambda$$

$$var(X) = \lambda$$

$$M_X(s) = e^{\lambda(e^s-1)}$$

Binomial

$$P_X(x) = \binom{n}{k} p^x (1-p)^{n-x}$$

$$E[X] = np$$

$$var(X) = np(1-p)$$

$$M_X(x) = (1 - p + pe^s)^n$$

Geomatric

$$P_X(x) = (1-p)^{x-1} p \quad , x = 1, 2, 3 \ldots$$

$$E[X] = \frac{1}{p}$$

$$var(X) = \frac{(1-p)^2}{p^2}$$

$$M_X(x) = \frac{pe^s}{1-(1-p)e^s}$$

Uniform (Continuous)

$$f_X(x) = \frac{1}{b-a}, \text{ if } a \le x \le b$$

$$E[X] = \frac{b+a}{2}$$

$$var(X) = \frac{b^2+a^2-ab}{3}$$

$$M_X(s) = e^{sb} \cdot M_X(sa)$$

Normal (Gaussian)

$$f_X(x) = \frac{1}{\sqrt{2\pi}\,\sigma} \cdot e^{-\frac{(x-\mu)^2}{2\sigma^2}}$$

$$E[X] = \mu$$

$$var(X) = \sigma^2$$

$$M_X(s) = e^{s\mu} \cdot e^{\frac{s^2\sigma^2}{2}}$$

Exponential

$$f_X(x) = \lambda e^{-\lambda x}$$

$$E[X] = \frac{1}{\lambda}$$

$$var(X) = \frac{1}{\lambda^2}$$

$$M_X(s) = \frac{\lambda}{\lambda - s}$$