1- Discrete Random variables (for $0 \le p \le 1$, we use $q := 1-p$)

Bernoulli: $X \sim \text{Bernoulli}(p)$

$$\mathbb{P}(X=1)=p \quad \text{and} \quad P(X=0)=q\,.$$
$$\mathbb{E}(X)=p, \quad \text{Var}(X)=pq,\ M_X(t)=q+pe^t.$$

Binomial: $X \sim \text{Binomial}(n,p)$, $n \in \mathbb{N}$.

$$\mathbb{P}(X=k)=\binom{n}{k}q^{n-k}p^k, \quad k=0,1,\dots,n.$$
$$\mathbb{E}(X)=np, \quad \text{Var}(X)=npq,\ M_X(t)=(q+pe^t)^n.$$

Geometric: $X \sim \text{Geometric}(p)$

$$\mathbb{P}(X=k)=q^{k-1}p, \quad k=1,2,\dots$$
$$\mathbb{E}(X)=\frac{1}{p}, \quad \text{Var}(X)=\frac{q}{p^2},\ M_X(t)=\frac{pe^t}{1-qe^t}.$$

Poisson: $X \sim \text{Poisson}(\lambda)$, $\lambda > 0$.

$$\mathbb{P}(X=k)=\frac{\lambda^k e^{-\lambda}}{k!}, \quad k=0,1,\dots$$
$$\mathbb{E}(X)=\lambda, \quad \text{Var}(X)=\lambda,\ M_X(t)=e^{\lambda(e^t-1)}.$$

Negative Binomial: $X \sim \text{NB}(n,p)$, $n \in \mathbb{N}$.

$$\mathbb{P}(X=k)=\binom{k-1}{n-1}p^n q^{k-n}, \quad k=n,n+1,\dots$$
$$\mathbb{E}(X)=\frac{n}{p}, \quad \text{Var}(X)=\frac{nq}{p^2},\ M_X(t)=\left(\frac{pe^t}{1-qe^t}\right)^n.$$

2- Continuous Random variables

Uniform: $X \sim U(a,b)$, where $a<b$.

$$f_X(x)=\begin{cases} \frac{1}{b-a}, & a<x<b \\ 0 & \text{otherwise} \end{cases}$$
$$\mathbb{E}(X)=\frac{a+b}{2}, \quad \text{Var}(X)=\frac{(b-a)^2}{12}, \quad M_X(t)=\frac{e^{bt}-e^{at}}{t(b-a)},\ t\neq 0.$$

Exponential: $X \sim \text{Exp}(\lambda)$, where $\lambda>0$.

$$f_X(x)=\begin{cases} \lambda e^{-\lambda x}, & x>0 \\ 0 & \text{otherwise} \end{cases}$$
$$\mathbb{E}(X)=\frac{1}{\lambda}, \quad \text{Var}(X)=\frac{1}{\lambda^2}, \quad M_X(t)=\frac{\lambda}{\lambda-t},\ t<\lambda.$$

Normal: $X \sim N(\mu,\sigma^2)$, where $\mu,\sigma \in \mathbb{R}$.

$$f_X(x)=\frac{1}{\sqrt{2\pi\sigma^2}}\exp\left(-\frac{(x-\mu)^2}{2\sigma^2}\right), \quad -\infty<x<\infty.$$
$$\mathbb{E}(X)=\mu, \quad \text{Var}(X)=\sigma^2, \quad M_X(t)=e^{\mu t+\frac{(\sigma t)^2}{2}}.$$

Cauchy:

$$f_X(x)=\frac{1}{\pi(1+x^2)}, \quad -\infty<x<\infty.$$
$$\mathbb{E}(X)=\text{undefined}, \quad \text{Var}(X)=\text{undefined}.$$

Gamma: $X \sim \Gamma(\omega,\lambda)$, where $\omega,\lambda>0$.

$$f_X(x)=\begin{cases} \frac{1}{\Gamma(\omega)}\lambda^\omega x^{\omega-1}e^{-\lambda x}, & x>0 \\ 0 & \text{otherwise} \end{cases}, \quad \Gamma(\omega)=\int_0^\infty x^{\omega-1}e^{-x}dx.$$
$$\mathbb{E}(X)=\frac{\omega}{\lambda}, \quad \text{Var}(X)=\frac{\omega}{\lambda^2}, \quad M_X(t)=\left(\frac{\lambda}{\lambda-t}\right)^\omega,\ t<\lambda.$$