Continuous Distributions

Uniform Distribution: $X \in \mathcal{U}(a,b),\ 0 < a < b$, if its pdf is $f(x) = \dfrac{1}{b-a},\ x \in [a,b]$.

Normal Distribution: $X \in N(\mu,\sigma),\ \mu \in \mathbb{R},\ \sigma > 0$, if its pdf is $f(x) = \dfrac{1}{\sigma\sqrt{2\pi}} e^{-\dfrac{(x-\mu)^2}{2\sigma^2}},\ x \in \mathbb{R}$.

Standard (Reduced) Normal Distribution: $X \in N(0,1)$, if its pdf is $f(x) = \dfrac{1}{\sqrt{2\pi}} e^{-\dfrac{x^2}{2}},\ x \in \mathbb{R}$.

Gamma Distribution: $X \in Gamma(a,b),\ a,b > 0$, if its pdf is $f(x) = \dfrac{1}{\Gamma(a)b^a} x^{a-1} e^{-\dfrac{x}{b}},\ x > 0$.

$$\left(\Gamma(a) = \int_0^\infty x^{a-1} e^{-x} dx\ ,\ a > 0 \right)$$

Exponential Distribution: $X \in Exp(\lambda) = Gamma(1, 1/\lambda),\ \lambda > 0$, if its pdf is $f(x) = \lambda e^{-\lambda x}\ ,\ x > 0$.

χ^2 Distribution: $X \in \chi^2(n,\sigma) = Gamma(n/2, 2\sigma^2),\ n \in \mathbb{N},\ \sigma > 0$, if its pdf is

$$f(x) = \frac{1}{\Gamma\left(\frac{n}{2}\right) 2^{\frac{n}{2}} \sigma^n} x^{\frac{n}{2}-1} e^{-\frac{x}{2\sigma^2}}\ ,\ x > 0.$$

Student (T) Distribution: $X \in T(n),\ n \in \mathbb{N}$, if its pdf is $f(x) = \dfrac{\Gamma\left(\frac{n+1}{2}\right)}{\sqrt{n\pi}\ \Gamma\left(\frac{n}{2}\right)} \left(1 + \dfrac{x^2}{n}\right)^{-\frac{n+1}{2}},\ x \in \mathbb{R}$.

Erlang Distribution: $X \in Erl(a,r) = Gamma\left(a, \frac{1}{ar}\right),\ a,r > 0$, if its pdf is

$$f(x) = \frac{ar}{\Gamma(a)} (arx)^{a-1} e^{-arx}\ ,\ x > 0.$$

Beta Distribution: $X \in Beta(a,b),\ a,b > 0$, if its pdf is $f(x) = \dfrac{1}{\beta(a,b)} x^{a-1}(1-x)^{b-1}\ ,\ x \in [0,1]$.

$$\left(\beta(a,b) = \int_0^1 x^{a-1}(1-x)^{b-1} dx\ ,\ a,b > 0 \right)$$

Beta Distribution of the 2^{nd} Kind: $X \in Beta_{II}(a,b),\ a,b > 0$, if its pdf is

$$f(x) = \frac{1}{\beta(a,b)} x^{a-1}(1+x)^{-(a+b)}\ ,\ x > 0. \qquad \left(\beta(a,b) = \int_0^\infty x^{a-1}(1+x)^{-(a+b)} dx\ ,\ a,b > 0 \right)$$

Cauchy Distribution: $X \in Cauchy(a,b),\ a \in \mathbb{R},\ b > 0$, if its pdf is $f(x) = \dfrac{1}{\pi b \left[1 + \left(\dfrac{x-a}{b}\right)^2\right]},\ x \in \mathbb{R}$.

Fisher (F) Distribution: $X \in F(m,n),\ m,n \in \mathbb{N}$, if its pdf is

$$f(x) = \frac{1}{\beta\left(\frac{m}{2}, \frac{n}{2}\right)} \left(\frac{m}{n}\right)^{\frac{m}{2}} x^{\frac{m}{2}-1} \left(1 + \tfrac{m}{n} x\right)^{-\frac{m+n}{2}}\ ,\ x > 0.$$