Continuous Distributions

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

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

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

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

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

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

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

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

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

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

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

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