uniform distribution : (minimum, maximum)

probability density function (PDF) $\begin{cases} \frac{1}{max-min} & min \le x \le max \\ 0 & \text{(otherwise)} \end{cases}$

cumulative distribution function (CDF)

$$P(X \le x) = \begin{cases} \frac{x - min}{max - min} & min \le x \le max \\ 1 & x > max \end{cases}$$

poisson distribution : (mean $= \mu$)

$$\text{pdf: } P(X = x) = \begin{cases} \frac{e^{-\mu} \mu^{x}}{x!} & (x \ge 0) \\ 0 & \text{(otherwise)} \end{cases}$$

$$\text{cdf: } P(X \le x) = \begin{cases} Q(\lfloor x \rfloor + 1, \mu) & x \ge 0 \\ 0 & \text{(otherwise)} \end{cases}$$

($\lfloor x \rfloor$ is a floor function, $Q(a,x)$ is the regularized incomplete grammar function)

binomial distribution : (number of trials "n" (positive integer), probability of success "p" (0 or 1))

$$\text{pdf: } P(X = x) = \begin{cases} p^{x} \binom{n}{x} (1-p)^{n-x} & 0 \le x \le n \\ 0 & \text{(otherwise)} \end{cases}$$

$\binom{n}{m}$ is the binomial coefficient

$$\text{cdf: } P(X = x) = \begin{cases} I_{1-p}(n - \lfloor x \rfloor, \lfloor x \rfloor + 1) & 0 \le x < n \\ 1 & x \ge n \end{cases}$$

$I_z(a,b)$ is the regularized incomplete beta function

exponential distribution: (rate "λ" (positive))

$$\text{pdf: } \begin{cases} \lambda e^{\lambda(-x)} & x \ge 0 \\ 0 & \text{otherwise} \end{cases}$$

$$\text{cdf: } \begin{cases} 1 - e^{\lambda(-x)} & x \ge 0 \\ 0 & \text{otherwise} \end{cases}$$

z distribution : (mean : $\mu = 0$) (standard deviation : $\sigma = 1$)

$$\text{pdf: } \frac{e^{\frac{-x^2}{2}}}{\sqrt{2\pi}}$$

$$\text{cdf: } P(X \le x) = \int_{-\infty}^{x} \frac{e^{-\left(\frac{x^2}{2}\right)}}{\sqrt{2\pi}} = \frac{1}{2} \operatorname{erfc}\left(-\frac{x}{\sqrt{2}}\right)$$

t distribution : (v (positive))

$$\text{pdf: } \frac{\left(\frac{v}{v+x^2}\right)^{(v+1)/2}}{\sqrt{v} \quad B(v/2, 1/2)}$$

$B(a,b)$ is the beta function

cdf: $P(X \le x) = \begin{cases} \frac{1}{2} I_{\frac{v}{x^2+v}}\left(\frac{v}{2}, \frac{1}{2}\right) & x \le 0 \\ \frac{1}{2}\left(I_{\frac{x^2}{x^2+v}}\left(\frac{1}{2}, \frac{v}{2}\right) + 1\right) & \text{(otherwise)} \end{cases}$

confidence intervals: (with t distribution?)

$x \pm \frac{t_{(1-c/2)}\, s}{\sqrt{n}}$

n: sample size
s: sample standard deviation
x: sample mean
c: confidence level

confidence intervals for proportion:

$\hat{p} \pm \sqrt{\frac{(1-\hat{p})\hat{p}}{n}}\, Z_{(1-c/2)}$

$\hat{p}$: sample proportion
n: sample size
c: confidence level

$\downarrow$

$\hat{p} \pm \underbrace{(CV)}_{\text{confidence value}} \cdot \underbrace{SE(\hat{p})}_{\text{standard error}}$

Confidence Intervals for z distribution:

example: (95% CI) $\mu \pm 1.96 \frac{\sigma}{\sqrt{n}}$

μ: mean
σ: standard deviation
size: n

Confidence Intervals for t distribution:

$\begin{cases} \alpha\text{-level} = 1 - \text{desired confidence level} \\ \text{df (degree of freedom)} = \text{sample size} - 1 \end{cases}$