		E	D
二项	$B(n,p)=\binom{n}{k}p^k(1-p)^{n-k}$	np	$np(1-p)$
泊松	$\pi(\lambda)=\frac{\lambda^k}{k!}e^{-\lambda}$	λ	λ
几何	$G(p)=(1-p)^{k-1}\cdot p$	$1/p$	$\frac{1-p}{p^2}$
超几何	$H=\frac{\binom{N_1}{x}\binom{N_2}{n-x}}{\binom{N}{n}}$	$n\frac{N_1}{N}$	
均匀	$U(a,b)$	$\frac{a+b}{2}$	$\frac{(b-a)^2}{12}$
指数	$E(\lambda)=\lambda e^{-\lambda x}$	$1/\lambda$	$1/\lambda^2$
正态	$N(\mu,\sigma^2)=\frac{1}{\sqrt{2\pi}\sigma}e^{-\frac{(x-\mu)^2}{2\sigma^2}}$	μ	σ^2
卡方	$\chi^2(n)=\sum^n[N(0,1)]^2$	n	$2n$
t	$t(n)=\frac{N(0,1)}{\sqrt{\chi^2(n)/n}}$	0	$\frac{n}{n-2}$
F	$F(n_1,n_2)=\frac{\chi^2(n_1)/n_1}{\chi^2(n_2)/n_2}$	$\frac{n_2}{n_2-2}$	

$F(x)=P(\xi\le x)$ $Y=g(x)$ 概率密度 $f_Y(y)=f_X(g^{-1}(y))\left|\frac{g^{-1}(y)}{dy}\right|$

$E(X^2)=\int x^2 f(x)\,dx$

$D(X)=E[(X-EX)^2]=EX^2-E^2X$

$D(CX)=C^2DX$

$D(X+Y)=DX+DY+2\mathrm{cov}(X,Y)$

$\mathrm{cov}=E[(X-EX)(Y-EY)]=E(XY)-EXEY$

相关系数 $\rho_{XY}=\frac{\mathrm{cov}(X,Y)}{\sqrt{DXDY}}\le 1$

$f_{X|Y}(x|y)=f(x,y)/f_Y(y)$ 独立性: dis $P_{ij}=\sum P_i\sum P_j$ ana $f(x,y)=f_X(x)\cdot f_Y(y)$

$Z=X+Y$, $f_Z(z)=\int_{-\infty}^{+\infty}f(z-y,y)\,dy$

$aX+bY$, $\int\frac{1}{|b|}f(x,\frac{z-ax}{b})\,dx$

XY, $\int\frac{1}{|x|}f(x,\frac{z}{x})\,dx$

X/Y $\int|x|f(x,xz)\,dx$

独立MAX $F_Z(z)=\prod F_{X_i}(z)$

独立MIN $F_Z(z)=1-\prod[1-F_{X_i}(z)]$

$Z=g(X,Y)$, $EZ=\iint g(x,y)f(x,y)\,dxdy$

$f_X(x)=\int f(x,y)\,dy$

中心矩: $E(X-EX)^k$

$\xrightarrow{d}$: $\forall\varepsilon$, $\lim_{n\to\infty}P(X-p<\varepsilon)=1$

inequal

Markov $P(X\ge a)\le EX/a$, $a>0, X\ge 0$

Chebyshev $P\{|X-EX|\ge\varepsilon\}\le DX/\varepsilon^2$, $\varepsilon\ge 0$

$E(\lambda)$: $P\{x>t\}=P\{x>s+t\,|\,x>s\}$

$\pi(n),\chi^2(n)$: 独立可加性 $X+Y\sim\pi(n+m)$

$n\to\infty$, $t\sim N(0,1)$

LLN

Bernoulli fre $\xrightarrow{d}$ pro

Chebyshev avg $\xrightarrow{d}$ avg of exp

Khinchin avg $\xrightarrow{d}$ exp

CLT

Lindeberg $\frac{\overline{X}-EX}{\sigma/\sqrt{n}}\xrightarrow{d}N(0,1)$, 独立同分布, $\frac{xn}{xn}$

Lyapunov $S_n^2=\sum_{i=1}^n\sigma_i^2$, $\frac{1}{S_n}\sum(X_i-EX_i)\xrightarrow{d}N(0,1)$

De Moivre-Laplace $\frac{X-np}{\sqrt{np(1-p)}}\xrightarrow{d}N(0,1)$ $X\sim B(n,p)$

样本 $E\bar{X}=\mu$. $D\bar{X}=\sigma^2/n$. $ES_{n-1}^2=\sigma^2$, $DS_{n-1}^2=2\sigma^4/(n-1)$

对总体 $X\sim N(\mu,\sigma^2)$ 有 ① $\bar{X}\sim N(\mu,\sigma^2/n)$, ② $\frac{(n-1)S^2}{\sigma^2}=\chi^2(n-1)$ ③ $\frac{\bar{X}-\mu}{S/\sqrt{n}}\sim t(n-1)$

④ $\frac{S_1^2/S_2^2}{\sigma_1^2/\sigma_2^2}\sim F(n_1-1,n_2-1)$, 当 $\sigma_1^2=\sigma_2^2$ 时, $\frac{(\bar{X}-\bar{Y})-(\mu_1-\mu_2)}{S_w\sqrt{\frac{1}{n_1}+\frac{1}{n_2}}}\sim t(n_1+n_2-2)$, $S_w=\sqrt{\frac{(n_1-1)S_1^2+(n_2-1)S_2^2}{n_1+n_2-2}}$

无偏: $E\hat{\theta}=\theta\longrightarrow$ 有效: σ^2_{min}

相合: $n\to\infty$, $\hat{\theta}\to C$

$F_\alpha=\frac{1}{F_{1-\alpha}}$

矩估计: 用k个原点矩代替样本矩量∧　　最大似然: $L(p)=\prod_{i=1}^{n}P(x_i=X_i)$, $\hat{\theta}$: $\frac{d\ln L(\theta)}{d\theta}=0$　量大写

置信Lv $=1-\alpha$ 区间: 估计 μ　σ^2　$\left(\bar{X}\pm\frac{\sigma}{\sqrt{n}}Z_{\alpha/2}\right)$　$\cancel{\sigma^2}$　$\left(\bar{X}\pm\frac{S}{\sqrt{n}}t_{\alpha/2}(n-1)\right)$

估计 σ^2　μ　$\left(\frac{\sum(X_i-\mu)^2}{\chi^2_{\alpha/2}(n)},\frac{\sum(X_i-\mu)^2}{\chi^2_{1-\alpha/2}(n)}\right)$　$\cancel{\mu}$　$\left(\frac{(n-1)S^2}{\chi^2_{\alpha/2}(n-1)},\frac{(n-1)S^2}{\chi^2_{1-\alpha/2}(n-1)}\right)$

双正态, 估计 $\mu_1-\mu_2$　$\sigma_1^2\,\sigma_2^2$　$\left(\bar{X}-\bar{Y}\pm Z_{\alpha/2}\sqrt{\frac{\sigma_1^2}{n_1}+\frac{\sigma_2^2}{n_2}}\right)\leftarrow$ 或 $n_1,n_2\gg0$, S代σ　$\cancel{\sigma_1}=\cancel{\sigma_2}$　$\left(\bar{X}-\bar{Y}\pm t_{\alpha/2}(n_1+n_2-2)\cdot S_w\cdot\sqrt{\frac{1}{n_1}+\frac{1}{n_2}}\right)$

估计 σ_1^2/σ_2^2　$\mu_1\mu_2$　$\left(\frac{S_1^2}{S_2^2}\cdot\frac{1}{F_{\alpha/2}},\frac{S_1^2}{S_2^2}\cdot\frac{1}{F_{1-\alpha/2}}\right)$　$(F(n_1-1,n_2-1))$

0-1 估计 p. (p_1,p_2), $p_{1,2}=\frac{1}{2a}\left(-b\mp\sqrt{b^2-4ac}\right)$　$\begin{cases}a=n+Z^2_{\alpha/2}\\ b=-(2n\bar{X}+Z^2_{\alpha/2})\\ c=n\bar{X}^2\end{cases}$

正态检验 H_0,H_1, 拒绝域:

检验 μ:　σ^2　$Z=\frac{\bar{X}-\mu_0}{\sigma/\sqrt{n}}\sim N(0,1)$, 双边 $|Z|\geq Z_{\alpha/2}$　右边 $Z\geq Z_\alpha$

$\cancel{\sigma^2}$　$T=\frac{\bar{X}-\mu_0}{S/\sqrt{n}}\sim t(n-1)$　双边 $|T|\geq t_{\alpha/2}$　右边 $T\geq t_\alpha$

$\chi^2=\frac{\sum(X_i-\mu)^2}{\sigma_0^2}\longrightarrow$ 检验 σ^2:　μ　双 $(0,\chi^2_{1-\alpha/2}(n))\cup(\chi^2_{\alpha/2}(n),+\infty)$　右 $(\chi^2_\alpha(n),+\infty)$　左 $(0,\chi^2_{1-\alpha}(n))$

$\chi^2=\frac{(n-1)S^2}{\sigma_0^2}\longrightarrow$　$\cancel{\mu}$　上面自由度 $\to n-1$