

$$\tilde{x} = x_{\frac{(n+1)}{2}} \qquad \tilde{x} = \frac{x_{\frac{n}{2}} + x_{\frac{n}{2}+1}}{2} \qquad \bar{x} = \sum_{i=1}^n \frac{x_i}{n}$$

$$P = (n-1)! \qquad P_r = \frac{n!}{(n-r)!} \qquad P_r = \frac{n!}{n_1!n_2!\dots n_k!}$$

$$N_r = \frac{n!}{r!(n-r)!} \qquad P(A) = \frac{n}{N} \qquad P = n!$$

$$P(A \cup B) = P(A) + P(B) - P(A \cap B) \qquad P(A) + P(A') = 1$$

$$P(B|A) = \frac{P(A \cap B)}{P(A)}, \quad P(A) > \text{false} \qquad P(A) = \sum_{i=1}^k P(B_i \cap A) = \sum_{i=1}^k P(B_i)P(A|B_i)$$

$$P(B_r|A) = \frac{P(B_r \cap A)}{\sum_{i=1}^k P(B_i \cap A)} = \frac{P(B_r)P(A|B_r)}{\sum_{i=1}^k P(B_i)P(A|B_i)} \qquad P(B|A) = \left( \frac{P(B)}{P(A)} \right) P(A|B)$$

$$P(a < X < b) = \int_a^b f(x)dx \qquad \int_{-\infty}^{\infty} f(x)dx = 1 \qquad \sum_x \sum_y f(x,y) = 1 \qquad \int_{-\infty}^{\infty} \int_{-\infty}^{\infty} f(x,y) dx dy = 1$$

$$P(a < x < b) = F(b) - F(a) \qquad f(x) = dF(x)/dx$$

$$h(y) = \int_{-\infty}^{\infty} f(x,y) dx \qquad g(x) = \int_{-\infty}^{\infty} f(x,y) dy$$

$$g(x) = \sum_y f(x,y) \qquad h(y) = \sum_x f(x,y)$$

$$f(x|y) = \frac{f(x,y)}{h(y)}, \quad h(y) > 0 \qquad f(y|x) = \frac{f(x,y)}{g(x)}, \quad g(x) > 0$$

$f(x,y) = g(x)h(y)$  tells you something

$$\mu = E(X) = \sum_x x f(x)$$

$$\mu = E(X) = \int_{-\infty}^{\infty} x f(x) dx$$

$$\mu_{g(x)} = E[g(X)] = \sum_x g(x) f(x)$$

$$\mu_{g(x)} = E[g(X)] = \int_{-\infty}^{\infty} g(x) f(x) dx$$

**Error! Objects cannot be created from editing field codes.**

Deviation = x-μ

$$\sigma^2 = E[(X - \mu)^2] = \sum_x (X - \mu)^2 f(x)$$

$$\sigma^2 = E[(X - \mu)^2] = \int_{-\infty}^{\infty} (x - \mu)^2 f(x) dx$$

$$\sigma^2 = E(X^2) - \mu^2$$

$$\sigma_{g(X)}^2 = E\left[\left(g(X) - \mu_{g(X)}\right)^2\right] = \sum_x \left[\left(g(X) - \mu_{g(X)}\right)^2\right] f(x)$$

$$\sigma_{g(X)}^2 = E\left[\left(g(X) - \mu_{g(X)}\right)^2\right] = \int_{-\infty}^{\infty} \left(g(X) - \mu_{g(X)}\right)^2 f(x) dx$$

$$\sigma_{XY} = \int_{-\infty}^{\infty} \int_{-\infty}^{\infty} (X - \mu_X)(Y - \mu_Y) f(x, y) dx dy$$

$$\sigma_{XY} = E(XY) - \mu_X \mu_Y$$

$$\rho_{XY} = \frac{\sigma_{XY}}{\sigma_X \sigma_Y}$$

$$E[aX+b] = a E(X) + b(1)$$

$$E[g(X, Y) \pm h(X, Y)] = E[g(X, Y)] \pm E[h(X, Y)]$$

$E[XY] = E[X] * E[Y]$  for a specific condition (what is it?)

$$\sigma^2_{aX+b} = a^2 \sigma_X^2 + 0 = a^2 \sigma^2$$

$$\sigma^2_{aX+bY} = a^2 \sigma_X^2 + b^2 \sigma_Y^2 + 2ab \sigma_{XY}$$

$$P(\mu - k\sigma < X < \mu + k\sigma) \geq \left[1 - \frac{1}{k^2}\right]$$