Formulario probabilità

$$P(B|A) = \frac{P(A \cap B)}{P(A)}$$

Variabili aleatorie:

Distribuzione: $P(X=x) = \frac{|X=x|}{|\Omega|}$

Valore atteso: $E(X) = \sum_{x \in Im(X)} xP(x)$

Varianza: $V(X) = \sum_{x \in Im(X)} [x - E(X)]^2 P(x)$

Covarianza: $E(X \cdot Y) - E(X) \cdot E(Y)$

Variabile	$P(k)$	$E(X)$	$V(X)$
$Bern(p)$	$P(1) = p, P(0) = 1-p$	p	$p(1-p)$
$Bin(n,p)$	$\binom{n}{k} p^k (1-p)^{n-k}$	np	$np(1-p)$
$Geom(p)$	$p(1-p)^{k-1}$	$\frac{1}{p}$	$\frac{1-p}{p^2}$
$BinNeg(n,p)$	$\binom{k-1}{n-1} p^n (1-p)^{k-n}$	$\frac{n}{p}$	$\frac{n(1-p)}{p^2}$
$Poisson(\lambda)$	$e^{-\lambda} \frac{\lambda^k}{k!}$	λ	λ
$Multi(n, p_1, ..., p_k)$	$\frac{n!}{n_1!...n_k!} p_1^{n_1} ... p_k^{n_k}$		

Variabili aleatorie continue:

$$f_X(x) = \frac{1}{b-a} \quad a \leq x \leq b$$

$$P(c < x < d) = \int_c^d f_X(x)dx$$

$$F_X(k) = P(X \leq k) = \int_{-\infty}^k f_X(x)dx$$

$$E(X) = \int_{-\infty}^{+\infty} x f_X(x)dx \implies E(X^2) = \int_{-\infty}^{+\infty} x^2 f_X(x)dx$$

$$V(X) = \int_{-\infty}^{+\infty} [x - E(X)]^2 f_X(x)dx = E(X^2) - [E(X)]^2$$

Gaussiana $W(\mu, \sigma^2)$:

$f_X(x) = \frac{1}{\sqrt{2\pi\sigma^2}} e^{-\frac{1}{2}\frac{(x-\mu)^2}{\sigma^2}}$

$X = \sigma Z + \mu \implies Z \backsim W(0,1)$

$F_X(k) = P(X \leq k) = \text{Tabella}$