Valore atteso variabili discrete

$$E(X) = \sum_x x p_X(x)$$

Valore atteso lancio del dado

$$\mu \quad = \quad 1\left(\frac{1}{6}\right) - 2\left(\frac{1}{6}\right) + 3\left(\frac{1}{6}\right) - 4\left(\frac{1}{6}\right) + 5\left(\frac{1}{6}\right) - 6\left(\frac{1}{6}\right)$$

Varianza lancio del dado

x	$m(x)$	$(x - 7/2)^2$
1	1/6	25/4
2	1/6	9/4
3	1/6	1/4
4	1/6	1/4
5	1/6	9/4
6	1/6	25/4

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

$$\begin{aligned} V(X) &= \frac{1}{6}\left(\frac{25}{4} + \frac{9}{4} + \frac{1}{4} + \frac{1}{4} + \frac{9}{4} + \frac{25}{4}\right) \\ &= \frac{35}{12}\ , \end{aligned}$$

$$D(X) = \sqrt{35/12} \approx 1.707$$

Varianza lancio del dado come differenza momenti

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

$$\begin{aligned} E(X^2) &= 1\left(\frac{1}{6}\right) + 4\left(\frac{1}{6}\right) + 9\left(\frac{1}{6}\right) + 16\left(\frac{1}{6}\right) + 25\left(\frac{1}{6}\right) + 36\left(\frac{1}{6}\right) \\ &= \frac{91}{6}\ , \end{aligned}$$

$$V(X) = E(X^2) - \mu^2 = \frac{91}{6} - \left(\frac{7}{2}\right)^2 = \frac{35}{12}$$

Valore atteso variabili continue

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

Valore atteso variabile uniforme

$$E(X) = \int_0^1 x\, dx = 1/2$$

Varianza variabile uniforme

$$\sigma^2 = \int_{-\infty}^{\infty} (x - \mu)^2 f(x)\, dx$$

$$V(X) = \int_0^1 \left(x - \frac{1}{2}\right)^2 dx = \frac{1}{12}$$