<discrete>

Joint pmf

$$p_{X_1,X_2}(x_1,x_2) = P[X_1 = x_1,\ X_2 = x_2]$$

$$(x_1, x_2) \in D$$

properties:

(i) $0 \le p_{X_1X_2}(x_1,x_2) \le 1$

(ii) $\sum_D \sum p_{X_1,X_2}(x_1,x_2) = 1$

$$P[(X_1,X_2) \in B] = \sum_B \sum p_{X_1,X_2}(x_1,x_2)$$

<continuous>

Joint pdf

$$\frac{\partial^2 F_{X_1X_2}(x_1,x_2)}{\partial x_1 \partial x_2} = f_{X_1,X_2}(x_1,x_2)$$

properties:

(i) $f_{X_1,X_2}(x_1,x_2) \ge 0$

(ii) $\iint_D f_{X_1,X_2}(x_1,x_2)\,dx_1\,dx_2 = 1$

$f_{X_1,X_2}(x_1,x_2)$ 아래의 부피

$$P[(X_1,X_2) \in A] = \iint_A f_{X_1,X_2}(x_1,x_2)\,dx_1\,dx_2$$