Assignment 9

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Papoulis chap 6 Ex 6.73

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Problem

6-73. Show that for any x and y, the random variable $z = F_x(x)$ and $w = F_y(y|x)$ are independent and each is uniform in the interval $(0, 1)$

Solution

The system $z = F_X(x) \qquad w = F_Y(y|x)$ has a solution only if $0 \leq z \leq 1$ and $0 \leq w \leq 1$. Furthermore,

$$\frac{\partial z}{\partial x} = f_X(x), \qquad \frac{\partial z}{\partial y} = 0 \tag{1}$$

$$\frac{\partial w}{\partial x} = 0, \qquad \frac{\partial w}{\partial y} = f_Y(y|x) \tag{2}$$

$$J = f_X(x) f_Y(y|x) \tag{3}$$

$$f_{zw}(z, w) = \frac{f_{XY}(x, y)}{f_X(x) f_Y(y|x)} = 1 \quad \textit{for} \quad 0 \leq z, w \leq 1 \tag{4}$$

CODES

Python

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