Question

A 2-bit 4x4 image region is given by:

$$\begin{vmatrix} 4 & 5 & 4 & 6 \\ 7 & 6 & 5 & 5 \\ 6 & 5 & 4 & 5 \\ 7 & 5 & 6 & 4 \end{vmatrix}$$

Let u be a random variable representing a gray level in a given region of an image.

a)   Define $p_u(x) @ \text{Prob}[u = x]$

Question

b)   Compute $p_u(5)$

Question

c)   Define the second order joint probability

$$p_{u_1,u_2}(x_1, x_2) @ \text{Prob}[u_1 = x_1, u_2 = x_2]$$

Question

d)   Compute $p_{u1,u2}(5,6)$ if $u_1 = u(m,n)$ and $u_2 = u(m+1, n+1)$ (no symmetry required)

Question

e)   Compute the texture feature contrast from the second order joint probabilities

Question

f)   Second order joint probabilities are useful in texture analysis. Mention two other common texture analysis methods (no mathematical definitions are needed)