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ECE 4720 HW 1

2.3)

a) $R_{mm} = \lambda_{22} + (\lambda_{12} – \lambda_{22}) \int_{R1} p(\mathbf{x}|\omega_2)\, d\mathbf{x} = \lambda_{11} + (\lambda_{21} – \lambda_{11}) \int_{R2} p(\mathbf{x}|\omega_1)\, d\mathbf{x}$

$= 0 + (1 – 0) \int_{R1} p(\mathbf{x}|\omega_2)\, d\mathbf{x} + 0 + (1 – 0) \int_{R2} p(\mathbf{x}|\omega_1)\, d\mathbf{x}$

$= \int_{R1} p(\mathbf{x}|\omega_2)\, d\mathbf{x} + \int_{R2} p(\mathbf{x}|\omega_1)\, d\mathbf{x}$

b)

2.5)

$p(x|\omega_i) = T(\mu_i, \delta_i) = \{[(\delta_i - |x - \mu_i|)/ \delta_i^2$, for $| x - \mu_i | < \delta_i]$, [0, otherwise]}

2.7)

$p(x|\omega_i) = (1/\pi b) * 1/(1+((x-a_i)/b)^2)$,   i=1,2

E = P(error)

a)

ω_2 but actually ω_1

$E_1 = E(x|\omega_1) = \int p(x|\omega_1)\, P(\omega_1)$

$P(\omega_1)$ = ½ (assumption)

$=1/2 \, {}_x\int^{inf} (1/\pi b) * 1/(1+((x-a_2)/b)^2)\, dx$

b)

ω_1 but actually ω_2

$E_2= \int p(x|\omega_2)\, P(\omega_2)$

$P(\omega_2)$ = ½ (assumption)

$=1/2 \, {}_{-inf}\int^{x} (1/\pi b) * 1/(1+((x-a_1)/b)^2)\, dx$

c)

$E_1 + E_2 = E$

d)

$E = .1 + 1/2\pi \, {}_{-inf}\int^{x} 1/(1+(x-1)^2)\, dx$

$= .1 + 1/2\pi \, {}_{-inf}\int^{x} ((1+(x-1)^2)^{-1}\, dx$

e)