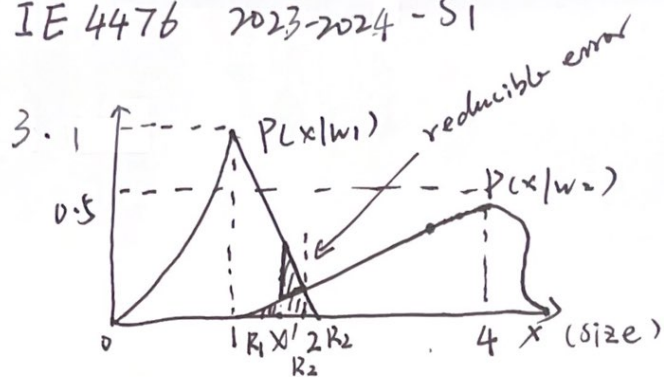


IE 4476 2023-2024 - S1



$$(a) \quad P(w_1) = \frac{40}{40+60} = 0.4 \quad P(w_2) = \frac{60}{40+60} = 0.6$$

$$P(w_1|x) = -x+2 \quad (1 \leq x \leq 2) \quad P(w_2|x) = \frac{1}{6}x - \frac{1}{6} \quad (2 \leq x \leq 4)$$

$$p(e) = 1 - P(w_1) \int_{R_1} P(x|w_1) dx - P(w_2) \int_{R_2} P(x|w_2) dx$$

$$= P(w_1) \int_{R_2} P(x|w_1) dx + P(w_2) \int_{R_1} P(x|w_2) dx$$

$$= 0.4 \times \int_{x'}^2 (-x+2) dx + 0.6 \times \int_1^{x'} (\frac{1}{6}x - \frac{1}{6}) dx$$

$$= 0.4x(\frac{1}{2}x^2 - 2x' + 2) + 0.1x(\frac{1}{2}x'^2 - x' + 0.5)$$

$$= 0.25x'^2 - 0.8x' + 0.85 = 0.25(x' - 1.8)^2 + 0.04$$

$$x' = 1.5$$

$$p(e) = 0.25(1.5 - 1.8)^2 + 0.04$$

$$= 0.0625$$

(b) decide w_1 when $x \leq 1.8$
 decide w_2 when $x > 1.8$
 according to (a).

$$p(e) = 0 + 0.04 = 0.04$$