Q-13 O11818781

P.3.16

$$g(x) = \mathbb{P}[y = +1 / x].$$

		true class	
		+1 (correct)	-1 (intruder)
you say	+1	0	c_a
	-1	c_r	0

a) cost (accept) $= (1 - g(x))\, c_a$; cost (reject) $= g(x)\, c_a$

$$\text{cost}(\text{accept}) = 0 \times P(y{+}1/x) + c_a \times P(y=-1/x)$$

$$c_a(1-g(x)) = c_a \mathbb{P}(y=-1/x)$$

$$\text{cost (reject} = c_a P[y=+1/x] + 0\, P(y=-1/x)$$

$$c_a(g(x)) = c_a P[y=+1/x]$$

b) desired $\boxed{K = \frac{C_a}{C_a + C_r}}$

if cost (accept) = cost (reject)

$$C_a (1 - g(x)) = C_r \, g(x)$$

$$C_a = g(x)(C_a + C_r)$$

$$g(x) = \frac{C_a}{C_a + C_r}$$ where k is threshold $k \cong g(x)$

(c) Super mart

		+1	-1
h	+1	0	1
	-1	10	0

CIA

		+1	-1
h	+1	0	1000
	-1	1	0

→ reject need to be avoided which should be with k

reject $g(x) < k$ which is 0

→ for CIO false negative should be with k

$$g(x) \geq k.$$

Q8

(A) $E_{in}(w) = \sum_{n=1}^{N} [\![y_n = +1]\!] \ln \frac{1}{h(x_n)} + [\![y_n = -1]\!] \ln \frac{1}{1-h(x_n)}$

$$P(y|x) = \begin{cases} h(x) & y = +1 \\ 1-h(x) & y = -1 \end{cases}$$

Substitutini $P(y|x) = \theta(y w^T x)$

$$E_{in}(w) = \sum_{n=1}^{N} [\![y_n = +1]\!] \ln \left(\frac{1}{\theta(y_n w^T x_n)} \right)$$

$$+ [\![y_n - 1]\!] \ln \left(\frac{1}{1-\theta(y_n w x_n)} \right)$$

$$= \sum_{n=1}^{N} [\![y_n = +1]\!] \ln \left[\frac{1 + e^{y_n w^T x_n}}{e^{y_n w^T x_n}} \right] + [\![y_n = -1]\!] \ln \left[\frac{1 - e^{-y_n w^T x}}{e^{-y_n w^T x}} \right]$$

$$E_{in} = \sum_{n=1}^{N} [\![y_n = +1]\!] \ln \left(e^{-y_n w^T x_n} + 1 \right) + [\![y_n - 1]\!] \ln \left(e^{y_n w^t x_n} + 1 \right)$$

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(b) from above equation & Eq 3.9 in L.FD

text boon

$$E_{in}(w) = \frac{1}{N} \sum_{n=1}^{N} \ln\left(1 + e^{-y_n w^T x_n}\right)$$

for two probabil dist $\{p, 1-p\}$ & $\{q, 1-q\}$

give cross entr becam

$$p \log \frac{1}{q} + (1-p) \log \frac{1}{1-q}$$

This is for the point, to get the enh in sample erro we can sup p & q in the solved eq which can be

$$E_{in}(w) = \frac{1}{N} \sum_{n=1}^{n} (p) \ln\left(\frac{1}{q}\right) + (1-p) \ln\left(\frac{1}{1-q}\right)$$

This is the total in sample err.