University of Victoria

University of Victoria

Department of Electrical and Computer Engineering

Assignment 1

Student:
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Matriculation Number:
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ECE 500 Course Name

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Question X

(1)

$$\begin{cases} \sum_{i=1}^{m} w_i x_i + b + \sqrt{-2ln\zeta} = 0 \\ \sum_{i=1}^{m} w_i x_i + b - \sqrt{-2ln\zeta} = 0 \end{cases}$$

(2) Here is the question:

Answer:

Then we set the threshold at zero, which means:

$$\begin{cases} w_1 x_1 + w_2 x_2 + b \leq 0 & y = 0 \\ w_1 x_1 + w_2 x_2 + b > 0 & y = 1 \end{cases} \tag{1}$$

The font family has been changed to roman.

(3) Take all conditions into (1):

Table 1: Fitting performance with different regularization

MSE \ λ	0	0.01	0.1	1	10	100
train set	0.0389	0.4442	0.4583	0.4792	0.6491	1.3993
test set	0.6910	0.1572	0.1410	0.1136	0.2023	0.8647

(4)

$$b \leq 0 \tag{2}$$
$$w_1 + b > 0 \tag{3}$$
$$w_2 + b > 0 \tag{4}$$
$$w_1 + w_2 + b \leq 0 \tag{5}$$

(5)

$$\begin{aligned} LHS &= E_p \oint dA = E_p 4\pi r_p^2 \\ &= RHS = \frac{1}{\varepsilon} \iiint \rho(r) dV = \frac{1}{\varepsilon} \iiint \rho(r) dxdydz = \frac{1}{\varepsilon} \iiint \rho(r) r^2 sin\theta dr d\theta d\varphi \\ &= \frac{\rho_0}{\varepsilon a} \int_0^{r_p} r^3 dr \int_0^{\pi} sin\theta d\theta \int_0^{2\pi} d\varphi = \frac{\rho_0 \pi r_p^4}{\varepsilon a} \end{aligned}$$

(6) (1) AND:

$$v = \begin{bmatrix} -1.5 & 1 & 1 \end{bmatrix} \begin{bmatrix} 1 \\ x_1 \\ x_2 \end{bmatrix} \qquad y = \begin{cases} 0 & if\ v < 0 \\ 1 & if\ v \geq 0 \end{cases}$$

(7) (1)Comparision with a)

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%% Q3
% ground truth
AND = [ 0 0 1 1 ; 0 1 0 1 ; 0 0 0 1];
OR = [ 0 0 1 1 ; 0 1 0 1 ; 0 1 1 1];
COMPLEMENT = [ 0 1 ; 1 0];
NAND = [ 0 0 1 1 ; 0 1 0 1 ; 1 1 1 0];
XOR = [ 0 1 0 1 ; 0 0 1 1 ; 0 1 1 0];
```