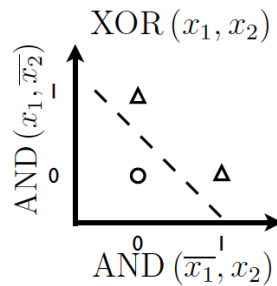


Instructions:

Please answer the questions below. Show all your work. This is an open-book test. NO discussion/collaboration is allowed.

Problem 1. (10 points)

Design a two-layer network with 3 neurons to implement XOR as shown in the following figure. See page 7 in the lecture 4 note for an example.



Clearly write down your choice of weights and biases for each neuron in its equation:

个数一分

$$y = f(w^T x - b)$$

$$\begin{aligned} & \text{AND}(x_1, \bar{x}_2) \\ &= x_1 + (-1)x_2 - 0 \end{aligned}$$

$$\longrightarrow w_{11} [1, -1] \quad b_{11} = 0 + 3$$

$$\begin{aligned} & \text{AND}(\bar{x}_1, x_2) \\ &= (-1)x_1 + (1)x_2 - (0) \end{aligned}$$

$$\longrightarrow w_{12} [-1, 1], \quad b_{12} = 0 + 3$$

$$\begin{aligned} & \text{OR}(s_1, s_2) \\ &= s_1 + s_2 + 0 \end{aligned}$$

$$\longrightarrow w_{21} [1, 1], \quad b_{21} = 0 + 3$$

$$A \oplus B = (A \wedge \bar{B}) \vee (\bar{A} \wedge B)$$

要按图中给出的逻辑表达式写

$$f(x) = \begin{cases} 1 & x > 0 \\ 0 & x \leq 0 \end{cases}$$

全对 +1

写成 $(A \vee B) \wedge (\bar{A} \vee \bar{B})$ 形式减3分

(与题中图给出的逻辑表达式不符)

w, b 的具体数值不作规定

只要满足逻辑功能即可

(See the next page)

$$w_{11} [1, 1] \quad b_{11} = 0$$

$$w_{12} [-1, -1] \quad b_{12} = 2$$

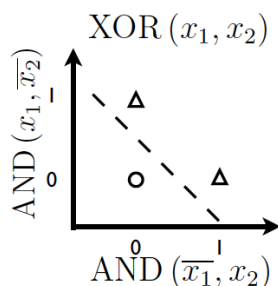
$$w_{21} [1, 1] \quad b_{21} = -1$$

Instructions:

Please answer the questions below. Show all your work. This is an open-book test. NO discussion/collaboration is allowed.

Problem 1. (10 points)

Design a two-layer network with 3 neurons to implement XOR as shown in the following figure. See page 7 in the lecture 4 note for an example.



Clearly write down your choice of weights and biases for each neuron in its equation:

$$y = f(w^T x - b)$$

Any answer that satisfies
 ① ② ③ is correct

$AND(x_1, \bar{x}_2)$:

only

$$\begin{aligned} w_1 * 1 + w_2 * 0 - b &> 0 \\ w_1 * 1 + w_2 * 1 - b &\leq 0 \\ w_1 * 0 + w_2 * 1 - b &\leq 0 \\ w_1 * 0 + w_2 * 0 - b &\leq 0. \end{aligned}$$

$$\begin{aligned} w_1 > b &\geq 0. \\ w_1 + w_2 &\leq b \\ w_2 &\leq b \end{aligned}$$

①

$$-w_2 \geq w_1 - b \geq 0, b \geq 0$$

$AND(\bar{x}_1, x_2)$:

only

$$\begin{aligned} w_1 * 0 + w_2 * 1 - b &> 0. \\ w_1 * 0 + w_2 * 0 - b &\leq 0 \\ w_1 * 1 + w_2 * 1 - b &\leq 0 \\ w_1 * 1 + w_2 * 0 - b &\leq 0 \end{aligned}$$

$$\begin{aligned} w_2 > b &\geq 0 \\ b &\geq 0 \\ w_1 + w_2 &\leq b \\ w_1 &\leq b. \end{aligned}$$

②

$$\begin{cases} -w_1 \geq w_2 - b > 0 \\ b \geq 0. \end{cases}$$

$OR(x_1, x_2)$:

only

$$\begin{aligned} w_1 * 0 + w_2 * 0 - b &\leq 0 \\ w_1 * 1 - b &> 0 \\ w_2 - b &> 0 \end{aligned} \Rightarrow$$

$$\begin{aligned} -w_2 \geq w_1 - b &> 0 \\ b &\geq 0 \end{aligned}$$

③

Quiz 2

Week 2, Sep/22/2021

CS 280: Fall 2021

Instructor: Lan Xu

Problem 2. (10 points)

Consider a multiclass logistic regression with L2 regularization as follows:

Name:

On your left:

On your right:

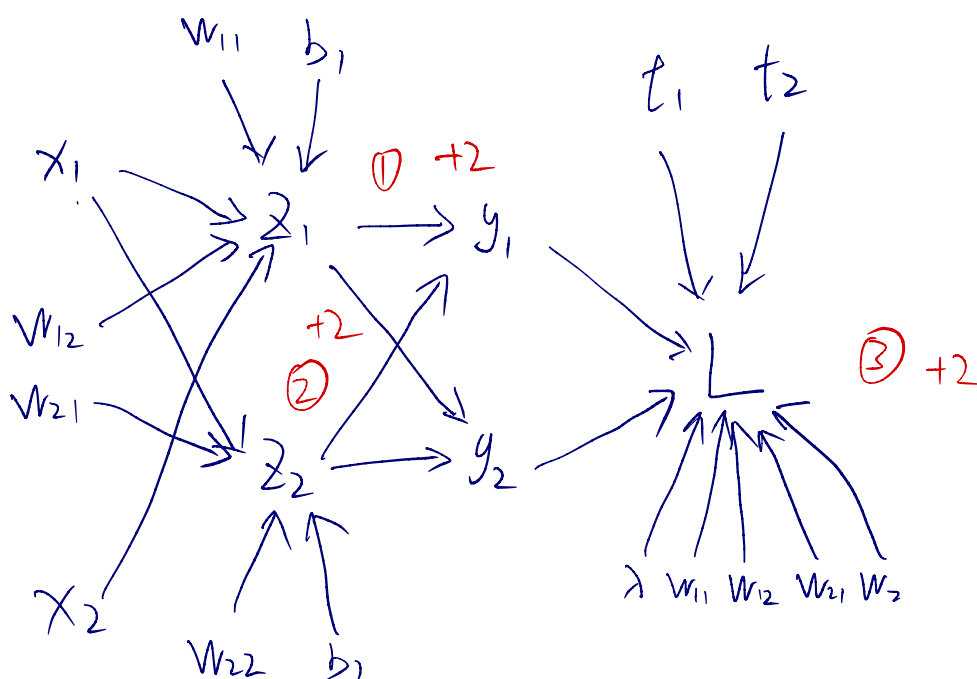
$$z_l = \sum_{j=1}^2 w_{lj} x_j + b_l, \quad l = 1, 2$$

$$y_k = \frac{e^{z_k}}{\sum_l e^{z_l}}, \quad k = 1, 2$$

$$\mathcal{L} = - \sum_k t_k \log y_k + \lambda \sum_{l=1}^2 \sum_{j=1}^2 \|w_{lj}\|^2$$

Draw the computational graph for this network and its loss, and write down its *forward* pass on the graph.

①对+6, ①②③处关键节点 输入输出有错-2



$$z_1 = w_{11} x_1 + w_{12} x_2 + b_1$$

$$z_2 = w_{21} x_1 + w_{22} x_2 + b_2$$

$$y_1 = \frac{e^{z_1}}{\sum_i e^{z_i}} \quad y_2 = \frac{e^{z_2}}{\sum_i e^{z_i}} \quad + 4 \text{ forward 过程}$$

$$\mathcal{L} = \text{照抄题目即可} \dots$$