Deep Learning CS583 Fall 2021
Quiz 1

October 12, 2021

Instructor: Jia Xu

Student name: _____

Student ID: _____

Student email address: _____

- **Read these instructions carefully**
- Fill-in your personal info, as indicated above.
- You have 24 hours.
- There are three questions. Each question worths the same (5 points).
- Both computer-typed and hand-writing in the very clear form are accepted.
- This is an open-book test.
- You should work on the exam only by yourself.
- Submit your PDF/Doc/Pages **by 12:30 Oct 13th** on Canvas under Final exam.

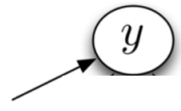
good luck!

1 Question

You are given one or several hidden nodes "h", two inputs x_1, x_2, and the output y. Draw a neural network and assign the weights and bias that performs AND operation:

- if $x_1 = 0$, $x_2 = 0$, then $y = 0$
- if $x_1 = 1$, $x_2 = 0$, then $y = 0$
- if $x_1 = 0$, $x_2 = 1$, then $y = 0$
- if $x_1 = 1$, $x_2 = 1$, then $y = 1$

The activation function outputs 1 if the input is greater than zero and outputs 0 otherwise.



2 Question

- If we have a recurrent neural network (RNN), we can view it as a different type of network by "unrolling it through time". Briefly explain what that entails.

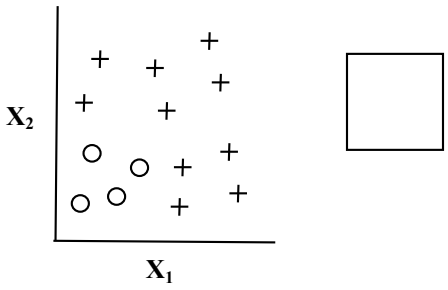
- Briefly explain how "unrolling through time" is related to "weight sharing" in convolutional networks.

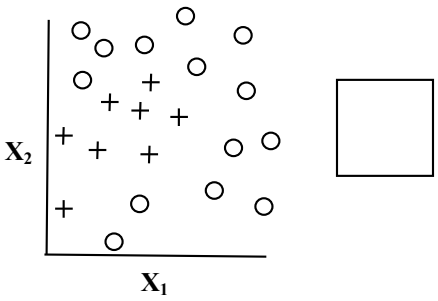
- In a deep neural network or a recurrent neural network, we can get vanishing or exploding gradients because the backward pass of back-propagation is linear, even for a network where all hidden units are logistic. Explain in what sense the backward pass is linear.

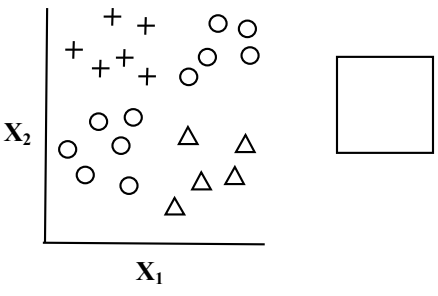
- Name a possible solution for the vanishing of the gradients and explain.

3 Question

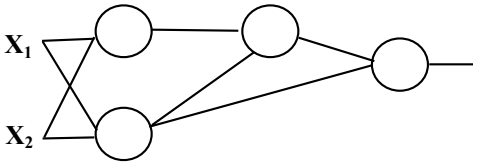
Recall that the output of a perceptron is 0 or 1. For each of the three following data sets, select the perceptron network with the fewest nodes that will separate the classes, and write the corresponding letter in the box. ***You can use the same network more than once.***



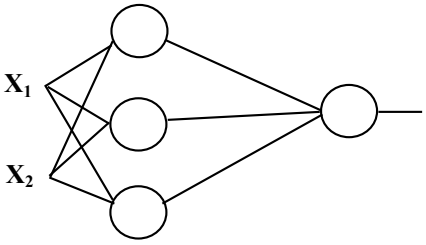




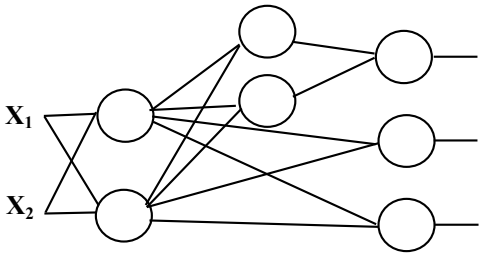
A



B



C



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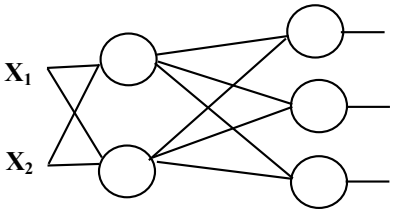

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