Tom Yeh (He/Him) • Following
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V. Can you calculate this by hand? [No.5: Seven Layers]
My five hands-on exercises to teach the basics of deep learning

[Exercise 5 of 5: Seven Layers, aka. Multi-Layer Perceptron (MLP)]

Unlike the previous four exercises, this exercise uses a compact form, making two simplifying assumptions:

1. All biases are zeros.
2. ReLU is directly applied to each cell (except for the output layer), for example, crossing out -5 and replacing it with 0.

Using this compact form, we can easily stack many layers to form a deeper network, like this seven layer network.

This exercise allows students to practice the following:

1. Inputs: The network takes a batch of two input vectors (x1, x2)
2. Layers: The network has seven layers.
3. Draw links between two layers of nodes
4. Shade corresponding weights (left) and links (right) in matching colors
5. Apply ReLU to "deactivate" negative values to 0 (except for the output layer).
6. Calculate one missing value in each layer

Layer 1: 0 x 3 + 1 x 4 + 1 x 5 = 9
Layer 2: 0 x 5 + 0 x 4 + 1 x 3 + 1 x 7 + (-1) x 9 = 1
Layer 3: 1 x 6 + 2 x 1 = 8
Layer 4: 0 x 7 + (-1) x 5 + 1 x 8 = 3
Layer 5: 1 x 2 + 0 x 3 = 2

If you missed the earlier exercises, you can review them below:
[1] Single Neuron: https://lnkd.in/gKqEGPgf
[2] Four Neurons: https://lnkd.in/gc-qwJ6X
[3] Hidden Layer: https://lnkd.in/gwDXEGsM
[4] Three Inputs: https://lnkd.in/eMjpAZta
[5] Multi Layer Perceptron (MLP): https://lnkd.in/gjJRxPsv

This picture contains a couple errors in the last few layers for the second input, can you spot them?

By completing these five hands-on exercises, many of my students told me they finally feel they have seen through the "blackbox" of a deep neural network. If you feel the same way, please [Like] this post. 👍

Moreover, if you are comfortable with math and feel you understand how to calculate the five missing values in this deep neural network, please give a [Celebrate] reaction. 👏

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