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Machine Learning

ML HW week 3

1/27/23

3.1 Consider a neuron with 2 inputs, 1 output, and a threshold activation function.

If the two weights are *w*1 = 1 and *w*2 = 1, and the bias is *b* = −1*.*5, then what

is the output for input (0*,* 0)? What about for inputs (1*,* 0), (0*,* 1), and (1*,* 1)?

Draw the discriminant function for this function, and write down its equation. Does

it correspond to any particular logic gate?

h = -1.5 + 1 x 0 + 1x0 = -1.5

h = -1.5 + 1 x 1 + 1 x 0 = -.5

h = -1.5 + 1 x 0 + 1 x 1 = -.5

h = -1.5 + 1 x 1 + 1 x 1 = .5

3.2 Work out the Perceptrons that construct logical NOT, NAND, and NOR of

their inputs.

W1 = 0 w2 = 0 b = 0

W1 = 0 w2 = 1 b = 0

W1 = 0 W2 = 0 b = 1

The parity problem returns 1 if the number of inputs that are 1 is even, and

0 otherwise. Can a Perceptron learn this problem for 3 inputs? Design the network

and try it.

3.4

I couldn’t get any of the codes online to work.

4.1 Work through the MLP shown in Figure 4.2 to ensure that it does solve the

XOR problem.

h = -1 x .5 + 1 x 1 + 0 x 1 = -.5 + 1 = .5 = 1

h = -1 x 1 + 1 x 1 + 0 x 1 = -1 + 1 = 0 = 0

h = -1 x .5 + 1 x 1 + 0 x -1 = .5

4.2 Suppose that the local power company wants to predict electricity demand

for the next 5 days. They have the data about daily demand for the last 5 years.

Typically, the demand will be a number between 80 and 400.

1. Describe how you could use an MLP to make the prediction. What parameters

would you have to choose, and what do you think would be sensible values for

them?

I would use the each day for the number of iterations and the power usage per day as the inputs. Then split the data into a 50:25:25 split

2. If the weather forecast for the next day, being the estimated temperatures for

daytime and nighttime, was available, how would you add that into your system?

It would use 2 features. One for daytime temperatures and one for nighttime temperatures.

3. Do you think that this system would work well for predicting power consumption?

Are there demands that it would not be able to predict?

I feel like there might be some unforeseen circumstances that might lead to extremes in the data such as heatwaves or extreme cold weather.

4.3 Design an MLP that would learn to hyphenate words correctly. You would

have a dictionary that shows correct hyphenation examples for lots of words, and

you need to choose methods of encoding the inputs and outputs that say whether

a hyphen is allowed between each pair of letters. You should also describe how you

would perform training and testing.

I’m a little confused by this question.