

INF3490/INF4490 Exercises - Week 6

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\mathbb{P} marks the programming exercises, we strongly recommend using the python programming language for these. Exercises may be added/changed after publishing.

1 Perceptron activation functions

Last week we used the activation function

$$g(h) = \begin{cases} 1 & h > 0 \\ 0 & h \leq 0 \end{cases}$$

Why is this not used with backpropagation?

2 Hidden layers

What is the minimum number of hidden neuron layers needed in order to approximate an arbitrary continuous function, and why?

3 Validation

Why do we use a validation set? Describe how the three different cross-validation methods presented in the lecture slides work, and what their advantages and disadvantages are.

4 Multi Layer Perceptron

Implement the MLP shown below, and train it to correctly perform the XOR function.

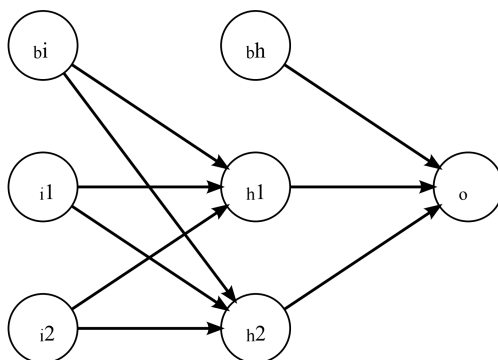


Figure 1: MLP with one hidden layer and two hidden nodes.

5 Delta(error) function

In the lecture slides the backpropagation deltas are first presented as

$$\delta_k = (y_k - t_k)y_k(1 - y_k)$$

What does this tell us about the activation function in use?

6 Natural language MLP

You are to design an MLP that would learn to hyphenate words correctly. You would have a dictionary that shows correct hyphenation examples for lots of words. Think about the following: What should the input to the neural net be?

- How should this input be encoded to work well with the classifier?
- How is should the output be encoded?
- How many layers do you need?
- How many neurons should there be in each layer?

Contact and Github

Corrections of grammar, language, notation or suggestions for improving this material are appreciated. E-mail me at olehelg@uio.no or use **GitHub** to submit an issue or create a pull request. The **GitHub repository** contains all source code for assignments, exercises, solutions, examples etc. As many people have been involved with writing and updating the course material, they are not all listed as authors here. For a more complete list of authors and contributors see the **README**.