

COMP815 Nature Inspired Computing

Assignment Part 3: Artificial Neural Networks

(Worth 20% of the total marks for COMP815)

Task

You will use a multilayer perceptron (MLP) to solve the XOR classification problem. You may base your code on that used for Task 7.3 in Workshop 7.

Continuous-valued training data are generated for training the XOR network. Noise (with normal distribution) is added to the 0's and 1's generated with a certain standard deviation (see the XOR_Dataset class). The default standard deviation is 0.1.

- (a) What is the effect of increasing the value of this standard deviation affect the classification accuracy of the trained MLP? Try increasing the standard deviation of the noise from 0.1 to 0.5 in 0.1 intervals and report on both the classification accuracies for the training data and the “unseen” test data.

Use the same model (i.e. one hidden layer with 4 nodes). Give plausible reasons for any change in accuracies.

- (b) For the worst-performing case in (a), would increasing the number of training epochs improve the accuracy? Provide evidence to support your answer and give plausible reason(s) why this is the case.
- (c) For the worst-performing case in (a), would increasing the number of nodes in the hidden layer improve the accuracy? Provide evidence to support your answer and give plausible reason(s) why this is the case.

Submission Requirements

Submit three separate Jupyter notebooks for (a), (b), and (c) above. Each notebook should contain:

- (1) Your answer to the respective question.
- (2) The experiments and results you have obtained to support your answer.
- (3) A conclusion.

The text in your notebook should clearly describe your process and results. Appropriate headings should be used to make your notebook readable by the marker.

Submit a Zip (do not use rar or other archive formats) file containing all three Jupyter notebooks to Canvas.