Design of a Multilayer Feedforward Neural Network Classifier and Approximator

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ECE 5730 Foundations of Neural Networks

Do not use any references to complete this project other than Haykin [1] and the course text(s).

Part 1: Classifier Design (this problem is based on computer experiment 6.9 in [1])

1. Download the following ASCII files from the online ECE 5730 syllabus: class1t.dat, class2t.dat, class1v.dat, and class2v.dat.
2. The files class1t.dat and class2t.dat contain examples of a two dimensional feature vector from classes 1 and 2, respectively. Design a multilayer feedforward neural network (MFNN) classifier using this training set using MATLAB®. *You are urged to first check the accuracy of your code by checking your results for a known less complex problem.*
3. Test your design using class1v.dat and class2v.dat. **YOU MAY NOT USE THIS DATA TO UPDATE NETWORK WEIGHTS**; you may use this data to terminate training.
4. Compare the performance of your classifier to the *ideal* classifier in which an **x** within a circle of radius 1.9227 centered at (5/3, 5/3) is considered as class 1. Any **x** outside this region is considered to be class 2.

Part 2: Approximator Design (similar examples are found in [2])

1. Download the following ASCII files from the online ECE 5730 syllabus approx1t.dat and approx1v.dat.
2. The file approx1t.dat contains examples of a one-dimensional mapping $\{t, x(t)\}$. Use these examples to design a MFNN approximator using MATLAB®.
3. Test our design using approx1v.dat. **YOU MAY NOT USE THIS DATA TO UPDATE NETWORK WEIGHTS**; you may use this data to terminate training.
4. **EXTRA CREDIT:** Design an electronic circuit to implement your approximator design utilizing operational amplifiers and passive components. Test your circuit using a circuit simulator. Compare the actual and desired performance of the circuit.

Maximum report length is 6 pages using the syllabus prescribed format. Attach your MATLAB® code to the report. **No collaboration is allowed on this project – complete this project on your own.**

References

[1] Simon Haykin, *Neural Networks: A Comprehensive Foundation*, IEEE Press, 1st edition, 1994.

[2] Christopher M. Bishop, *Neural Networks for Pattern Recognition*, Oxford University Press, 1995.