

31YB: Biologically Inspired Computing:

Lab Sheet 2 (Thurs, 6th Nov)

SNNS: Character Recognition Example using the MLP

Remember, if in difficulty consult the WWW manual which is available from:
<http://www.informatik.uni-stuttgart.de/ipvr/bv/projekte/snns/snns.html>

Run SNNS (see Lab Sheet 1 for details if you have forgotten!).

Use the FILE browser to LOAD the 'letters' example from directory: /usr/local/lib/SNNS/examples
(P.S. Remember, each example comes with a '.README' file)

This loads a network that has already been configured for you.

You should make sure that you load the 'letters' network file (NET), the 'letters' configuration file (CFG) and the 'letters' pattern file (PAT).

This network is designed to learn to discriminate between the different letters of the alphabet. The 7 x 5 input layer receives an 'image' of a character. The output layer has 26 units, one for each letter of the alphabet.

Q1. How many hidden units are there?

Open the WEIGHTS and GRAPH windows and set them up to allow you to visualise the training process and observe the mean-squared error (MSE).

Open the CONTROL window. Set up training using standard back-propagation (see Lab Sheet 1 if you've forgotten how to do this.)

Set the learning rate and the number of cycles.

Now train the network, remembering to initialise the weights first. (INIT, ALL).

Try training the network several times and try varying the learning rate.

Q2. What is a good learning rate for this problem?

Q3. Using this learning rate, how many cycles did training take to reach a MSE below 0.05?

Check that the network has learned the data set by selecting **TEST** repeatedly in order to test each of the 26 characters.

Q4. Does the network make any errors?

Now try training the network using back-propagation with momentum.

Select 'BackpropMomentum' from the LEARN menu.

The first two numbers in the LEARN parameters are the learning rate and momentum terms.

First try a learning rate of 0.1 and a momentum of 0.9 by entering:

LEARN

Initialise and train the network.

Now switch off momentum by entering:

LEARN

Initialise and train the network.

Repeat this experiment a few times with different learning rates (i.e. try momentum =0.0 and 0.9 for each learning rate)

Q5. Did adding the momentum term (0.9) help to speed up training always, sometimes or never ? How useful do you think momentum is in practice ? Why ?

Exercising SNNS's 3D display capability

Use the FILE browser to LOAD the 'letters3D' network and configuration files.

This is the same network but configured for 3D display.

Train this network and check that it has learned the data set.

Check that you understand the displays.

Q6. Is the 3D display a help or a hindrance ?

Q7. What is the value of the weight connecting unit 26 to unit 45 ?

Q8. Do you think it might be possible to explain how the network has solved the problem by examining the weights and the representation used at the hidden layer ?

Any comments, suggestions, please email: *Dr. A. Hussain* a.hussain@cs.stir.ac.uk