1. Download a dataset from the UCI Machine Learning Repository
It should contain more than 200 examples described with only numerical features. If there are
missing values, replace them with the most frequent value for the respective feature for the
respective class. The following datasets are suitable: breast-cancer-w, glass, liver-
disorders, pima-diabetes, new-thyroid, vowel.

2. Normalize data between 0 and 1.
3. Implement a backpropagation network with one hidden layer.
4. Run the following experiments:
   A. Separate the data into training (2/3 of the examples) and testing set (the remaining 1/3)
      • Backpropagation network with different number of hidden neurons
        Experiment with 5 different number of hidden neurons. Train on the training set and test on
        both the training and testing set. Prepare the following graphs:
        ➢ accuracy on training set (vertical axis) vs number of hidden neurons (horizontal axis)
        ➢ accuracy on testing set (vertical axis) vs number of hidden neurons (horizontal axis)
        ➢ number of epochs for convergence on training set (vertical axis) vs number of hidden
          neurons (horizontal axis)
      • Backpropagation network with different learning rates without momentum
        Experiment with 5 different learning rates. Train on the training set and test on both the
        training and testing set. Prepare the following graphs:
        ➢ accuracy on training set (vertical axis) vs learning rate (horizontal axis)
        ➢ accuracy on testing set (vertical axis) vs learning rate (horizontal axis)
        ➢ number of epochs for convergence on training set (vertical axis) vs learning rate
          (horizontal axis)
      • Backpropagation network with fixed learning rate and different momentums
        Select a large learning rate (e.g. 0.9). Experiment with various momentums. Train on the
        training set and test on both the training and testing set. Prepare the following graphs:
        ➢ accuracy on training set (vertical axis) vs momentum (horizontal axis)
        ➢ accuracy on testing set (vertical axis) vs momentum (horizontal axis)
        ➢ number of epochs for convergence on training set (vertical axis) vs momentum
          (horizontal axis)

   B. Based on the experiments from 1, choose an appropriate number of hidden neurons, learning rate
   and momentum. Use 10 fold cross validation to evaluate the performance of your network on the
data set. Include the training and testing accuracy for each fold and also the average results.

Note: accuracy is defined as the number of correctly classified examples / total number of examples

Write a brief report:
1. Description of data
2. Experimental setting
   • NN architecture
   • Parameters for each experiment (i.e. hidden neurons, learning rate, momentum)
3. Results and discussion
• Include the graphs and accuracy results as describe above
• Briefly discuss the results

Enclose your Matlab code.

Submission: both hard copy and by e-mail to: irena@it.usyd.edu.au.
Deadline: 2 May 2002