

## 31YB Tutorial 3: on 1<sup>st</sup> December, 2003

### Feedforward Neural Networks (PLR, DR, MLP/BP, RBF) continued

Q.

a) Discuss the differences between the MLP and RBF neural networks, in terms of:

- i) Biological plausibility
- ii) structural/architectural aspects
- iii) selection of network size (no. of inputs, hidden layer nodes etc.)
- iv) learning/training aspects (also outline appropriate learning algorithms for each)
- v) testing and generalization issues
- vi) types of applications for which they are suitable
- vii) relationship to fuzzy sets/logic [NOT Examinable]

b) The University of Stirling has about 7000 students, and has quite a lot of information about each :age, gender, qualifications on entry, year of study, exams passed, home postcode, for example. Discuss (in principle) how the University can use neural networks to attempt to find out whether there are particular clusters of students (for example, are there unexpected clusters such as postcodes from which only older students come to Stirling?).

### RECURRENT NETWORKS:

Q.

a) What does a Content Addressable Memory (CAM) mean? Explain how the Hopfield Network can act as a CAM?

b) Discuss the difference between a fully recurrent and a partially recurrent network? Is a recurrent network biologically inspired, if so, how?

Name two types of partially recurrent networks outlining their architectural differences and two application examples of each.

c) Show how a neural network can learn from temporal sequences, and identify any practical problems. Which type of a neural network would you expect to be more suitable for temporal learning?

d) Give one real world temporal-learning example problem, and show how you would choose a neural network for solving it. Your discussion should cover all the concepts you have studied in the course, including, selection/formatting network inputs & outputs, choice of neural network, learning/training issues, testing & generalization issues, other expected practical problems etc.

### GENETIC ALGORITHMS & NEUROMORPHIC SYSTEMS

Q.

a) Genetic algorithms and neural networks are both biologically inspired in certain ways. Discuss in what ways? Briefly describe the Genetic Algorithm and show how it differs from an evolutionary strategy.

b) Write a program (in Java/C++ or any other language of your choice) which implements the various steps of a Genetic Algorithm.

c) Discuss the suitability of GAs for performing optimisation in a highly complex and nonlinear space, comparing their performance with other commonly used optimisation methods. What problems can GAs encounter in practice.

d) Discuss the possibilities (if any) of GAs and neural networks working together to solve real world optimisation problems.

Q.

Write a short essay on neuromorphic systems which should cover: its definition, brief historical background, various technologies involved, timeliness and possible areas of application.