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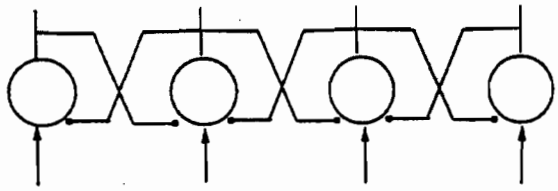
JG-D

Model Answer – Neural Computing, Question 2. 2000

(A)

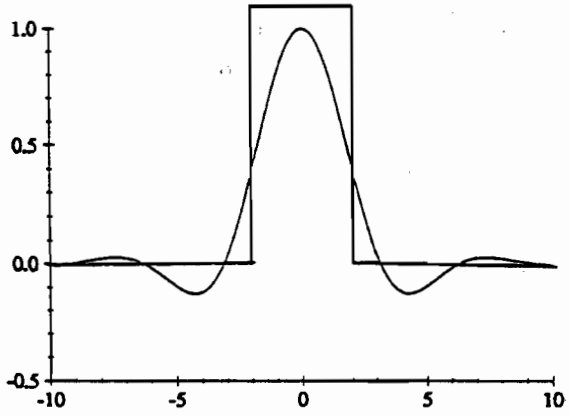
1. The parameters of a neural network model can be set via the minimisation of an appropriate error function. However, the goal of training is not to give good performance on the training data, but instead to give the best performance (in terms of smallest error) on independent, unseen data drawn from the same distribution as the training data. The ability of a neural network to give good results on unseen data is termed generalisation. If all of the available data were used in the training set and the model were made too large in order to fit all of it well, then it may become "over-trained" on this one set and will not generalize well to other sample sets. A simpler model trained just on a subset of the available data may actually show better generalisation. [4 marks]

2. (Diagram 124)



[2 marks]

3. (Diagram 125)



[2 marks]

4. A relaxation network. [2 marks]

....Continued....

(B)

1. The two principles of brain function that emerged from Karl Lashley's neurological research were:

   - The Law of Mass Action – the idea that much of the brain seems to participate in the performance of many tasks.
   - The Law of Equipotentiality – the idea that all brain tissue is basically the same, and has the *potential* to subserve any type of brain task if it is recruited to do so. [2 marks]

2. The brain is far more able to overcome, and to compensate for, an insult that develops or spreads slowly, than one caused by sudden trauma. [2 marks]

3. It is thought that the reason is recruitment: other non-injured tissue that may currently not be utilised is recruited to take over the functions served by the damaged tissue, provided there is time for this process to occur. [2 marks]

4. The implication is that brain circuits can train each other. Brain tissue that is involved in the performance of a specific task can transfer its acquired architecture or configuration to other tissue, during a gradual insult (like a spreading neoplasm). This is a remarkable form of adaptability and circuit flexibility, which constitutes a type of fault-tolerance that is unknown in computer hardware. [2 marks]

5. Any two examples from the following list:

   Broca's aphasia: disorders of speech production. Patients may be unable to read aloud, but can read to themselves and comprehend written material perfectly.

   Wernicke's aphasia: disorders of speech understanding. Such aphasics may be able to read sentences aloud but unable to comprehend the material.

   echolalia: a strong tendency to repeat exactly what is heard.

   conduction phasia: Fluent spontaneous speech, normal comprehension, but inability to repeat what is heard.

   alexia: Lost ability to comprehend written language.

   paralexia: Words are read as other words (substitution).

   dyslexia: Confounded letter combinations when reading.

   Computational significance: such disorders imply a remarkable specialisation of function for the different aspects of language. There is evidence that even the different grammatical parts of speech (such as verbs, nouns, prepositions) are stored in different specific places, because highly localised brain traumas can cause the loss of a particular such grammatical category.

   [2 marks]