NR/R09

Code No: B4304 / D4901, D0708, D4304

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M.Tech II Semester Examinations, March/April 2011

NEURAL AND FUZZY SYSTEMS

(Common to Power Electronics, Electrical Power Systems, Electrical Power Engineering)

Time: 3hours **Max.Marks:60**

Answer any five questions

All questions carry equal marks

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1. a) Explain the differences between conventional computation and neural network computation.
   b) Explain the historical development of neural systems.
   c) With schematic diagram explain the spiking neuron model. [12]

2. a) With suitable diagrams explain the neural dynamics
   b) With suitable examples explain the learning schemes of artificial neural networks. [12]

3. a) State and prove the perceptron convergence theorem.
   b) With suitable diagram explain the concept of back propagation? Derive update equations for weight elements of multi-layer feed-forward neural network. [12]

4. a) Construct an energy function for the continuous Hopfield neural network with size of N neurons and show that the energy function deceases every time the neuron output changed.
   b) Explain the architecture of Bi-directional Associative Memories. Also explain its storage and recall algorithms. [12]

5. a) Determine all possible α -level sets and all strong α-level for the following fuzzy sets:
   (i) $\tilde{A}$ = {(3, 0.1), (4, 0.2), (5, 0.3), (6, 0.4), (7, 0.6), (8, 0.8), (10, 1), (12, 0.8), (14, 0.6)}.
   (ii) $\tilde{B} = \{(x, \mu_B(x) = ((1+(x-10)^2)^{-1}\}$ for α = 0.3, 0.5, 0.8.
   (iii) $\tilde{C} = \{ (x, \mu_{\tilde{C}}(x) \mid x \in R \}$
   Where $\mu_{\tilde{C}}(x) = 0$ for $x \leq 10$, $\mu_{\tilde{C}}(x) = (1+(x-10)^{-2})^{-1}$ for $x > 10$.
   b) Explain some basic set theoretic operations for Fuzzy sets. [12]

6. a) Draw a block diagram of a possible fuzzy logic control system. Explain about each block.
   b) Explain the defuzzification methods that are used to convert fuzzy values to crisp values. [12]

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7. a) What are Kohonen's self organizing maps?. Explain the architecture and the training algorithm used for Kohonen's SOMs.
   b) With suitable diagram, explain the learning of Boltzmann's machines. [12]

8. a) Explain the architecture and learning algorithm of ART1.
   b) Explain the suitable ANN structures whose can be used for process identification. [12]

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M. Tech , Examination

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Note: 1. Answer any five questions
2. All questions carry equal marks

1 (a) Explain the characteristics of ANN. (4)
(b) With schematic diagram explain the mathematical modeling of Hodgkin – Huxley neuron. (4)
(c) What are the assumptions made in McCulloch-Pitts theory? Explain. (4)

1. (a) With suitable diagrams explain the Activation and Synaptic dynamics of neuron. (6)
(b) Derive the learning algorithm for multi-category perceptron networks. (6)

2. (a) Explain the limitations of backpropagation learning. Also explain the scope to over come these limitations. (5)
(b) Construct an energy function for a discrete and continuous Hopfield neural network, each of its size N neurons. Show that the energy function decreases every time the neuron output changed. (7)

4. (a) Explain the algorithms for storage and recall of information in Hopfiled networks. (5)
(b) Explain the concept of Simulated Annealing. Also explain how use this concept in training of Boltzmann networks. (7)

5. (a) Let X = { 1, 2, 3, . . . , 10}. Determine the cardinalities and relative cardinalities of the following fuzzy sets. (6)
(i) $\tilde{A}$ = {(3, 0.1), (4, 0.2), (5, 0.3), (6, 0.4), (7, 0.6), (8, 0.8), (10,1), (12, 0.8), (14, 0.6)}.
(ii) $\tilde{B}$ = {(2,0.4), (3, 0.6), (4, 0.8), (5, 1.0), (6, 0.8), (7, 0.6), (8, 0.4)}
(iii) $\tilde{C}$ = {(2, 0.4), (4, 0.8), (5, 1.0), (7, 0.6)}
(b) Explain some basic set theoretic operations for Fuzzy sets. (6)

6. (a) Explain the process involved in the development of fuzzy rule base system. (6)
(b) Explain the defuzzification methods that are used to convert fuzzy values to crisp values. (6)

5. (a) Explain the applications of self-organizing map networks (6)
(b) Explain the training algorithm of Kohonen's layer training algorithm.. (6)

8 (a) Describe the ART architectures and their processing algorithms. (6)
(b) Define the problem of process identification. What are the possible neural network configurations for plant identification? Explain each of them. (6)

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