

ME - I Sem - COMP
Elective I - Neural & Fuzzy Systems. ✓

19/12/07

Con. 4990-07.

muadda.com

(4)

BB-7527

(3 Hours)

[Total Marks : 100]

- (1) Question No. 1 is compulsory.
(2) Attempt any four questions out of remaining questions.
(3) Figures to the right indicate full marks.

Q1(a) Determine all α -level sets and all strong α -level sets for the following fuzzy set. 6

$$A = \{ (2,1), (4,0.2), (5,0.3), (6,0.4), (7,0.6), (8, 0.8), (10,1), (12, 0.8), (14, 0.6) \}$$

For $\alpha = 0.3, 0.5, 0.8$

(b) A single-neuron network using $f(\text{net}) = \text{sgn}(\text{net})$ has been trained using the pairs of x_i, d_i as shown below: 14

$$x_1 = [1, -2, 3, -1] \quad d_1 = -1$$

$$x_2 = [0, -1, 2, -1] \quad d_2 = 1$$

$$x_3 = [-2, 0, -3, -1] \quad d_3 = -1$$

The final weights obtained using the perceptron rule are $W_4 = [3 \ 2 \ 6 \ 1]^T$

Knowing that correction has been performed in each step for $c=1$, determine the following weights:

W_3, W_2, W_1 by back tracking the training.

muadda.com

Q2 Design a fuzzy controller to determine the wash time of domestic washing machine. Assume that input is dirt and grease on cloths. Use three descriptions for input variables and five descriptors for output variables. Derive set of rules for control action and defuzzification. The design should be supported by figures. Show that if the clothes are soiled to a larger degree the wash time will be more and vice-versa. 20

Q3 Determine the weights after one iteration for Delta learning rule. Use 20

Bipolar continuous activation function.

Given the input pattern with desired output

$$X_1 = [1, -2, 0, -1] \quad d_1 = -1;$$

$$X_2 = [0, 1.5, -0.5, -1] \quad d_2 = -1;$$

$$X_3 = [-1, 1, 0.5, -1] \quad d_3 = 1;$$

Initial weight vector $w_1 = [1, -1, 0, 0.5]$ assume learning constant $c=0.1$

Perform correction of weight in each state and why this correction is required?

muadda.com

Q4 (a) Prove the following identities: 10

(i) For unipolar continuous activation function $f'(\text{net}) = O(1-O)$

(ii) For bipolar continuous activation function $f'(\text{net}) = (1-O^2)/2$

Where O is out.

(b) Explain with suitable diagram error back propagation training algorithm. 10

Q6 What do you mean by learning? List different learning rules and explain any three using suitable diagram. 20

muadda.com

Q7 Write short notes on (any two): 20

- (i) Bidirectional associative memory with its algorithm
 - (ii) Character recognition using neural network
 - (iii) Hopfield network
 - (iv) Single Continuous Perceptron Training Algorithm
-

muadda.com

muadda.com