



HALDIA INSTITUTE OF TECHNOLOGY

(AN AUTONOMOUS INSTITUTION UNDER MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL)

Paper Code: MCS-PC 202

Paper Name: Soft Computing

Time Allotted: 2 Hours

Full Marks: 70

The figures in the margin indicate full marks

Candidates are required to give their answers in their own words as far as practicable

Group – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives from the followings:

30 x 1 = 30

(i) Competitive learning net is used for?

- a) Pattern grouping b) Pattern storage
- c) Pattern grouping or storage d) None of the mentioned

(ii) The process of fuzzy interference system involves

- a) membership function b) fuzzy logic operators
- c) IF-Then rules d) all the above

(iii) In case of autoassociation by feedback nets in pattern recognition task, what is the behavior expected?

- a) accretive b) interpolative c) can be either accretive or interpolative
- d) none of the mentioned

(iv) Why is the training of basis function is faster than MLFFNN?

- a) because they are developed specifically for pattern approximation
- b) because they are developed specifically for pattern classification
- c) because they are developed specifically for pattern approximation or classification
- d) none of the mentioned

(v) How are weights updated in feature maps?

- a) updated for winning unit only
- b) updated for neighbors of winner only
- c) updated for winning unit and its neighbors
- d) none of the mentioned

(vi) What is true for competitive learning?

- a) nodes compete for inputs
- b) process leads to most efficient neural representation of input space
- c) typical for unsupervised learning
- d) all of the mentioned

(vii) What is true regarding ADALINE learning algorithm

- a) uses gradient descent to determine the weight vector that leads to minimal error
- b) error is defined as MSE between neurons net input and its desired output
- c) this technique allows incremental learning
- d) all of the mentioned

(viii) Artificial neural network is used for

- a) Pattern recognition
- b) Pattern classification
- c) Clustering
- d) All of the above

(ix) In modeling, an optimal solution is understood to be

- a) a solution that can only be determined by an exhaustive enumeration testing of alternatives
- b) a solution found in the least possible time and using the least possible computing resources
- c) a solution that is the best based on criteria defined in the design phase
- d) a solution that requires an algorithm for the determination

(x) The union of two fuzzy sets is the _____ of each element from two sets

- a) maximum
- b) minimum
- c) equal to
- d) not equal to

(xi) What does a fuzzifier do

- a) converts crisp input to linguistic variables
- b) converts crisp output to linguistic variables
- c) converts fuzzy input to linguistic variables
- d) converts fuzzy output to linguistic variables

(xii) ____ decides who becomes parents and how many children the parents have.

- a) parent combination
- b) parent selection
- c) parent mutation
- d) parent replace

(xiii) Which of the following neural networks uses supervised learning?

- (A) Multilayer perceptron
- (B) Self organizing feature map
- (C) Hopfield network

- a) (A) only
- b) (B) only
- c) (A) and (B) only
- d) (A) and (C) only

(xiv) What are the following sequence of steps taken in designing a fuzzy logic machine?

- a) fuzzification → rule evaluation → defuzzification
- b) fuzzification → defuzzification → rule evaluation
- c) rule evaluation → fuzzification → defuzzification
- d) rule evaluation → defuzzification → fuzzification

(xv) Any soft-computing methodology is characterized by

- a) precise solution
- b) control actions are unambiguous and accurate
- c) control actions is formally defined
- d) algorithm which can easily adapt with the change of dynamic environment

(xvi) Which of the following operation is responsible to jump from one hill to another hill?

- a) Mutation
- b) Crossover
- c) Fitness function
- d) Natural selection

(xvii) What Are The Two Types Of Fuzzy Inference Systems?

- a) model-type and system-type
- b) momfred-type and semigi-type
- c) mamdani-type and sugeno-type
- d) mihni-type and sujgani-type

(xviii) In Evolutionary strategy

- a) does not use recombination to produce offspring. it only uses mutation
- b) uses recombination such as cross over to produce offspring
- c) uses various recombination operators
- d) none of the mentioned

(xix) How can learning process be stopped in backpropagation rule?

- a) there is convergence involved
- b) no heuristic criteria exist
- c) on basis of average gradient value
- d) none of the mentioned

(xx) Termination condition for EA

- a) mazimally allowed cpu time is elapsed
- b) total number of fitness evaluations reaches a given limit
- c) population diveristy drops under a given threshold
- d) all the mentioned

(xxi) Genetic algorithm is first introduce by_____.

- a) Charles Darwin
- b) John Holland
- c) Gregor Johan Mendel
- d) none of these

(xxii) Identify the working sequence of kmean clustering ?

- 1)redefine cluster centeroids 2)intialize the k centroids 3)make clusters near centroids
- a) 1,3,2
 - b) 3,2,1
 - c) 2,3,1
 - d) 2,1,3

(xxiii) Identify the kind of learning algorithm for “facial identities for facial expressions”.

- a) Prediction
- b) Recognition patterns
- c) generating patterns
- d) Recognizing anomalies

(xxiv) Identify the type of learning in which labeled training data is used.

- a) Semi-supervised
- b) Supervised
- c) Reinforcement
- d) Unsupervised

(xxv) Choose the general limitations of the backpropagation rule among the following.

- a) Slow convergence
- b) Scaling
- c) Local minima problem
- d) All of the above

(xxvi) What does K stand for in K mean algorithm?

- a) Number of clusters
- b) Number of data
- c) Number of attributes
- d) Number of iterations

(xxvii) Which of the following is used for machine learning in python?

- (a) scikit-learn
- (b) seaborn-learn
- (c) stats-learn
- (d) none of the mentioned

(xxviii) The output of training process in machine learning is

- a) machine learning model
- b) machine learning algorithm
- c) null
- d) accuracy

(xxix) In multiclass classification number of classes must be

- a) less than two
- b) equals to two
- c) greater than two
- d) option 1 and option 2

(xxx) You trained a binary classifier model which gives very high accuracy on the training data, but much lower accuracy on validation data. Which is false.

- a) this is an instance of overfitting
- b) this is an instance of underfitting
- c) the training was not well regularized
- d) the training and testing examples are sampled from different distributions

Group – B

(Multiple Choice Type Questions)

2. Choose the correct alternatives from the followings:

10 x 2 = 20

(i) If A and B are two fuzzy sets with membership functions

$$\mu_A(x) = \{0.6, 0.5, 0.1, 0.7, 0.8\}$$

$$\mu_B(x) = \{0.9, 0.2, 0.6, 0.8, 0.5\}$$

Then the value of $\mu(A \cup B)'(x)$ will be

- a) {0.9, 0.5, 0.6, 0.8, 0.8}
- b) {0.6, 0.2, 0.1, 0.7, 0.5}
- c) {0.1, 0.5, 0.4, 0.2, 0.2}
- d) {0.1, 0.5, 0.4, 0.2, 0.3}

(ii) Compute the value of adding the following two fuzzy integers:

$$A = \{(0.3,1), (0.6,2), (1,3), (0.7,4), (0.2,5)\}$$

$$B = \{(0.5,1), (1,2), (0.5,3), (0.4,4), (0.3,5)\}$$

Then, $f(A+B)$ is equal to

a){(0.5,1), (0.6,2), (1,3), (0.7,4), (0.7,5)}

b){(0.5,1), (0.6,2), (1,3), (1,4), (1,5)}

c){(0.3,1), (0.5,2), (0.5,3), (1,4), (0.7,5)}

d){(0.65,1),(1,2),(1,3),(0.82,4),(0.44,5)}

(iii) Mamdani-style inference involves which steps

a) fuzzification of the input variables& rule evaluation

b) aggregation of the rule output& defuzzification

c)both a and b

d) either a or b

(iv) Heteroassociative memory is also known as?

a) unidirectional memory

b) bidirectional memory

c) multidirectional associative memory

d) temporal associative memory

(v) Feedback connection strength are usually?

a) fixed

b) variable

c) both fixed or variable type

d) none of the mentioned

(vi) Choose the correct statement

1. A fuzzy set is a crisp set but the reverse is not true

2. If A,B and C are three fuzzy sets defined over the same universe of discourse such that $A \leq B$ and $B \leq C$ and $A \leq C$

3. Membership function defines the fuzziness in a fuzzy set irrespective of the elements in the set, which are discrete or continuous

a)1 only

b) 2 and 3

c)1,2 and 3

d) none of these

(vii) A 4-input neuron has weights 1,2,3,4. The transfer function is linear with the constant of proportionality being equal to 3. The inputs are 5,7,10,30 respectively. Output will be:

a) 120

b)213

c)420

d)507

(viii) Why can't we design a perfect neural network?

a) full operation is still not known of biological neurons

b) number of neuron is itself not precisely known

c) number of interconnection is very large & is very complex

d) all of the mentioned

(ix) Each connection link in ANN is associated with _____ which has information about the input signal.

- a) neurons b) weights c) bias d) activation function

(x) Consider a fuzzy set A defined on the interval $X = [0, 10]$ of integers by the membership function

$$\mu_A(x) = x / (x+2)$$

Then the α cut corresponding to $\alpha = 0.5$ will be

- a) {0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10}
b) {1, 2, 3, 4, 5, 6, 7, 8, 9, 10}
c) {2, 3, 4, 5, 6, 7, 8, 9, 10}
d) none of the above

Group – C
(Short Answer Type Questions)

3. Attempt any four from the followings:

4 x 5 = 20

i) Let the population of chromosomes in genetic algorithm is represented in terms of binary number. The strength of fitness of a chromosome in decimal form, x , is given by S as

$$f(x) = f(x) / \sum f(x) \text{ where } f(x) = x^2$$

The population is given by P where: $P = \{(01101), (11000), (01000), (10011)\}$

Calculate strength of (01000). Which chromosome has greater strength? [3+2]

ii) Consider the classification problem defined below-

$\{p1=[-1 \ 1], t1=1, p2=[0 \ 0], t2=1, p3=[1 \ -1], t3=1, p4=[1 \ 0], t4=0, p5=[0 \ 1], t5=0\}$

Design single neuron perceptron to solve this problem. Define decision boundary line.

[3+2]

iii) . Why BP (Back Propagation) algorithm is generalized form of delta learning rule? State limitations of BP network. [3+2]

iv) Explain Bayesian linear regression. Explain Linear Separability using an example. Is XOR Gate Linear Separable? [2+2+1]

v) Distinguish between a feed forward network and a recurrent network. [5]

vi) Design Hebb net to implement logical AND function. [5]

PATRALI PRADHAN

Signature of the Paper Setter/Moderator

Answer Key:

Group – A

- | | | | | | |
|---------|---------|--------|--------|---------|----------|
| 1. (i)c | (ii)d | (iii)c | (iv)c | (v)a | (vi)d |
| (vii)b | (viii)d | (ix)b | (x)a | (xi)a | (xii)b |
| (xiii)d | (xiv)a | (xv)d | (xvi)b | (xvii)c | (xviii)b |

(xix)a	(xx)d	(xxi)b	(xxii)c	(xxiii)b	(xxiv)b
(xxv)d	(xxvi)d	(xxvii)a	(xxviii)a	(xxix)c	(xxx)b

			Group – B		
2. (i)a	(ii)d	(iii)c	(iv)a	(v)a	(vi)b
(vii)d	(viii)d	(ix)b	(x)d		

			Group – C		
3. (i)64,11000	(ii)	(iii)	(iv)	(v)	(vi)