23/8/2023

Indian Institute of Engineering Science and Technology, Shibpur

M.Tech (CST) 1st Semester Final Examination, Dec. 2022

Subject: Soft Computing-open Elective Code: CS5161

Full Marks: 50 Time: 3 hr

Answer any four questions. Two mark is allotted for specific answer.

1. (a) For a decision system DS = (U, C, D), where U is the set of objects, C is the set of conditional attributes, D is the set of decision attributes.
Define the following terms:
   i. Lower approximation and upper approximation of a target set X.
   ii. Accuracy of target set X
   iii. Attribute dependency of D on S [i.e., $\gamma_S(D)$], for some $S \subseteq C$.

(4+2+2)

(b) Define the terms Core and Reduct of the decision system DS. (2+2)

2. a) Consider the following transactions. If minimum support is 30% and minimum confidence is 80%, determine the frequent item sets and association rules using the a-priori algorithm.

Transactions	Items
T1	Bread, Butter
T2	Bread, Milk, Butter
T3	Bread, Jelly, Butter
T4	Bread, Coke
T5	Bread, Milk
T6	Milk, Coke

(b) Write the drawbacks of a-priori Algorithm. 10+2

3. Write short notes on
(a) Particle swarm optimization, (b) Fuzzy c-means clustering Algorithm (6+6)

4. (a) What are the different steps of Genetic Algorithm ? Why it is called population based stochastic search algorithm?

(b) Say, we toss a fair coin 80 times and select six among them with the following fitness score (f = number of one in the string).

$s_1 = 1111010101$ $f(s_1) = 7$
$s_2 = 0111000101$ $f(s_2) = 5$
$s_3 = 1110110101$ $f(s_3) = 7$
$s_4 = 0100010011$ $f(s_4) = 4$
$s_5 = 1110111101$ $f(s_5) = 8$
$s_6 = 0100110000$ $f(s_6) = 3$

(i). Perform crossover between (s_1, s_2) and (s_5,s_6).
(ii). Calculate fitness score of new offsprings after crossover. 4+4+(2+2)

5. Describe the steps of self organizing process of a Self Organizing Feature Map Neural Network. 12

6.(a) What is Fuzzy Inference system?

(b)What are the two types of Fuzzy Inference Systems?

(c) Why do you need fuzzification and De-fuzzification operations in building a fuzzy inference system?

3+3+(3+3)