

B.E. COMPUTER SCIENCE AND ENGINEERING
FOURTH YEAR
SECOND SEMESTER EXAM 2020
SOFT COMPUTING

Time: Twelve hours

Full Marks : 50

Answer any *two* questions. 2 X 25 = 50

1. What is soft computing? How it differs from traditional hard computing? What are the differences between supervised and unsupervised learning algorithms? Explain briefly. What is the role of activation function in learning? What do you understand by competitive learning process?

5+5+5+5+5=25 [CO1]

2. Two fuzzy relations are given by

$$\begin{bmatrix} 0.4 & 0.6 & 0 \\ 0.9 & 1 & 0.1 \end{bmatrix} \quad \begin{bmatrix} 0.5 & 0.8 \\ 0.1 & 1 \\ 0 & 0.6 \end{bmatrix}$$

Obtain fuzzy relation R o S as Max-Product composition and Max-Min composition between these two fuzzy relations.

Describe four frequently used T-norm operators.

Consider the fuzzy production rule with two antecedents: "IF height is TALL and weight is MODERATE, THEN speed is HIGH." Given:

$$\begin{aligned} \mu_{TALL}(height) &= \left\{ \frac{0.5}{5'}, \frac{0.8}{6'}, \frac{1.0}{7'} \right\} \\ \mu_{MODERATE}(weight) &= \left\{ \frac{0.7}{45\text{ Kg}}, \frac{0.9}{50\text{ Kg}} \right\} \\ \mu_{HIGH}(speed) &= \left\{ \frac{0.6}{5\text{ ms}^{-1}}, \frac{0.7}{10\text{ ms}^{-1}}, \frac{0.9}{15\text{ ms}^{-1}} \right\} \\ \mu_{MORE-OR-LESS-TALL}(height) &= \left\{ \frac{0.7}{5'}, \frac{0.8}{6'}, \frac{0.6}{7'} \right\} \\ \mu_{MORE-OR-LESS-MODERATE}(weight) &= \left\{ \frac{0.75}{45\text{ Kg}}, \frac{0.85}{50\text{ Kg}} \right\} \end{aligned}$$

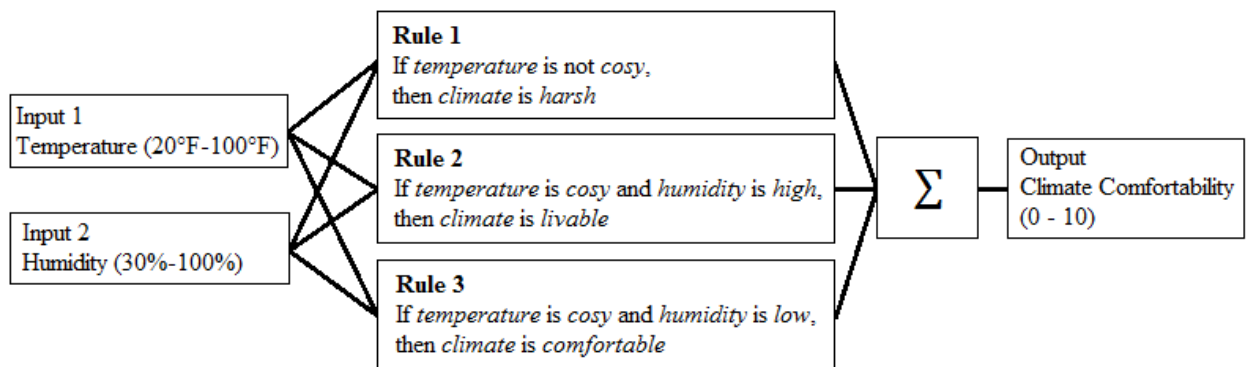
Find out the membership distribution for $\mu_{MORE-OR-LESS-HIGH}(speed)$ using a suitable implication function.

10+5+10=25 [CO1, CO2, CO3]

3. Illustrate Back-Propagation learning algorithm by means of a flowchart. What are the differences between Perceptron and Gradient-descent search? How Hebb learning is used for Auto associative network? Explain with proper example.

10+5+10=25 [CO1, CO2]

4. What do you mean by elitism selection properties of GA ? What are the pros and cons of it? How genetic algorithm may be utilized to find out the square root of a positive integer number? Describe the individual steps of GA for this problem. Summarize your implementation with a flowchart. (5+5)+10+5=25 [CO1, CO5]
5. Show ANFIS as a universal approximator. What are the problems of RBF networks. Given below is a “Climate comfortability” system. The system has two input variables, temperature and humidity, are taken through the fuzzy reasoning process with three If-Then rules, then the results from the rules are combined and transformed to a crisp climate comfortability value. You need to develop two FIS – one Mamdani FIS and second one Takagi-Sugeno FIS for this model and finally compare them.



$$5+5+15=25 \quad [\text{CO3, CO4}]$$

6. Write down the basic steps of Particle Swarm Optimization. Define parameters: inertial coefficient and acceleration coefficient, for PSO algorithm. Define upper and lower boundary regions for a rough set. You are planning for a picnic today, when the morning is cloudy.
- 50% of all rainy days start off cloudy!
 - But cloudy mornings are common (about 40% of days start cloudy).
 - And this is usually a dry month (only 3 of 30 days tend to be rainy, or 10%).

What is the chance of rain during the day? Compute using Bayes' rule.

$$10+5+10=25 \quad [\text{CO1}]$$