

MCA

(SEM – IV) EXAMINATION, 2016 – 17
NMCA – 413 : ARTIFICIAL INTELLIGENCE

3 Hours

Max. Marks : 100

Be precise in your answer. In case of numerical problem assume data wherever not provided.

SECTION – A

Explain the following :

(10 × 2 = 20)

- Name the elements of an agent.
- Summarize the factors that make up rationality.
- What do you infer from hill – climbing search algorithm?
- Compare propositional logic and predicate logic.
- Justify the usage of universal and existential quantifier with an example.
- Give the heuristic function for shortest path problem.
- Which algorithm is more similar to backward chaining algorithm? Write its algorithm.
- What do you mean by hybrid Bayesian network?
- Which value is assigned to alpha and beta in the alpha – beta pruning?
- List few decision tree algorithms.

SECTION – B

Attempt any five of the following questions : (5 × 10 = 50)

- Discuss the structure of an intelligent agent. Give an example.
- Compare the uniformed and informed search strategies with respect to all factors.
- Solve the 8 – puzzle problem using Hill climbing. Write down the heuristic function.

| Initial State | | | Goal State | | |
|---------------|---|---|------------|---|---|
| 1 | 2 | 3 | 1 | 2 | 3 |
| 8 | 6 | 5 | 4 | 5 | 6 |
| 7 | 4 | | 7 | 8 | |

- The law says that it is a crime for an American to sell weapons to hostile nations. The country Nono an enemy of America, has some missiles and all of its missiles were sold to it by Colonel West, who is American. Prove that Col. West is criminal by forward and backward chaining.
- Assume two players, min and max. play min (as describe above). Min plays first. If a terminal state in the search tree developed above is a win for min, a utility function of zero is assigned to that state. A utility function of 1 is assigned to a state if max wins the game. Apply the minimax algorithm to the search tree to assign utility functions to all states in the search tree.

- Consider the following data set :

| Feature 1 | Feature 2 | Feature 3 | Class |
|-----------|-----------|-----------|-------|
| 0 | 0 | 0 | 0 |
| 1 | 0 | 1 | 1 |
| 1 | 0 | 0 | 0 |
| 1 | 1 | 1 | 1 |
| 0 | 1 | 1 | 1 |
| 0 | 1 | 1 | 0 |

Assume the test pattern as feature 1 as 0, feature 2 as 0 and feature 3 as 1, classify the pattern using NNC and Bayes classifier

- (g) Write down the evaluation procedure of HMM.
 (h) How a k - means clustering algorithm works? example.

SECTION - C

Attempt any two of the following questions :

(2 × 15 = 30)

3. (a) Represent the following sentences in first - order logic, using a consistent vocabulary (which you must define) :
- Not all students take both History and biology.
 - Only one student failed history.
 - Only one student failed both History and Biology.
 - The best score in History was better than the best score in Biology.
 - Every person who dislikes all vegetarians is smart.
 - No person likes a smart vegetarian.
 - There is a woman who likes all men who are not vegetarians.
 - There is a barber who shaves all men in town who do not shave themselves.
 - No person likes a professor unless the professor is smart.
 - Politicians can fool some of the people all of the time and they can fool all of the people some of the time, but they can't fool all of the people all of the time.
- (b) (i) Give a predicate calculus sentence such that every world in which it is true contains exactly one object.
 (ii) Represent the sentence "All Germans speak the same languages" in predicate calculus. Use Speaks (x, l), meaning that person x speaks language.

4. Write in detail about the decision trees and decision lists with an example.

5. How parameter estimation is done? Explain with an example.

MCA

(SEM. IV) THEORY EXAMINATION, 2017-18
RCA - 403 : ARTIFICIAL INTELLIGENCE

Time : 3 Hours

Total Marks : 70

Note : Attempt **all** Sections. If require any missing data; then choose suitably.

SECTION - A

1. Attempt **all** questions in brief. (2 × 7 = 14)
- What is meant by the term Artificial Intelligence? How it is different from natural intelligence?
 - Discuss Branch-and-bound search algorithm.
 - Differentiate between local search and global search.
 - Transform the following formula to Prenex Normal form-

$$\forall x : \forall y : (\exists z : P(x, z) \cap P(y, z)) \rightarrow \exists u : Q(x, y, u)$$
 - Define forward chaining and backward chaining with example.
 - Explain in brief the concept of reinforcement learning.
 - Write a short note on Support Vector Machine.

SECTION - B

2. Attempt **any three** of the following : (7 × 3 = 21)
- What is an intelligent agent? Discuss any two types of intelligent agents.
 - Explain Steepest-ascent hill climbing algorithm. What are the problems with hill climbing algorithm?
 - Describe Hidden Markov model with suitable example. Also discuss its role in probabilistic reasoning.
 - Discuss Maximum-likelihood parameter learning for complete data with discrete models.
 - What do you mean by classification? Discuss the process of classification with the help of a diagram.

SECTION - C

3. Attempt **any one part** of the following : (7 × 1 = 7)
- Discuss the historical development of artificial intelligence.
 - For each of the following agents, develop a PEAS description of the task environment-
 - Mathematician's theorem proving assistant
 - Satellite image analysis system
 - Internet book shopping agent
 - Medical diagnosis system
4. Attempt **any one part** of the following : (7 × 1 = 7)
- Discuss Simulated Annealing search algorithm with its advantages and disadvantages.
 - What are the steps to define a problem? Explain also discuss various components of a problem.

5. Attempt any one part of the following : (7 × 1 = 7)
- (a) Discuss algorithm of conversion to clause form. Convert the following to clause form using algorithm
- $$\begin{aligned} \forall x [\text{Brick}(x) \rightarrow (\exists y (\text{On}(x, y) \cap \neg \text{Pyramid}(y)) \\ \cap \neg \exists y (\text{On}(x, y) \cap \text{On}(y, x)) \\ \cap \forall y (\neg \text{Brick}(y) \rightarrow \neg \text{Equal}(x, y)))] \end{aligned}$$
- (b) Explain the concept of Alpha-beta pruning. Write Alpha-beta search algorithm.

6. Attempt any one part of the following : (7 × 1 = 7)
- (a) Discuss various application domains of machine learning.
- (b) Describe major steps involved in a learning process. Also discuss how learning systems are classified.

7. Attempt any one part of the following : (7 × 1 = 7)
- (a) What is pattern recognition? Explain various steps involved in the designing of a pattern recognition system with the help of a diagram.
- (b) Explain Nearest Neighbor rule used for classification.

MCA**(SEM. IV) THEORY EXAMINATION, 2018-19**
RCA – 403 : ARTIFICIAL INTELLIGENCE

Time : 3 Hours

Total Marks : 70

Note : Attempt **all** Sections. If require any missing data; then choose suitably.**SECTION – A****1. Attempt all questions in brief.****(2 × 7 = 14)**

- (a) Name the elements of an agent.
- (b) Summarize the factors that make up rationality.
- (c) What do you infer from hill-climbing search algorithm?
- (d) Compare propositional logic & predicate logic.
- (e) Justify the usage of universal and existential quantifier with an example.
- (f) Give the heuristic function for shortest path problem.
- (g) Which algorithm is more similar to backward chaining algorithm? Write its algorithm.

SECTION – B**2. Attempt any three of the following :****(7 × 3 = 21)**

- (a) You have three jugs measuring 12 gallons, 8 gallons, and 3 gallons, and a water faucet. You need to measure out exactly one gallon.
- (b) Describe the planning method based on hierarchical task networks with an example.
- (c) Discuss the different design issues to be solved to use hidden markov model for real world application.
- (d) Assume two players, min and max, play (as described above). Min plays first. If a terminal state in the search tree developed above is a win for min, a utility function of zero is assigned to that state. A utility function of 1 is assigned to a state if max wins the game. Apply the minimax algorithm to the search tree to assign utility functions to all states in the search tree.
- (e) Give the completeness proof of resolution.

SECTION – C**1. Attempt any one part of the following :****(7 × 1 = 7)**

- (a) Implement the Search Algorithms described in this lecture in LISP and/or C. Comment on how suited each language would be for each type of search.
- (b) How suited would PROLOG be in implementing the search algorithms? Comment on how this might be done and what difficulties might exist.

4. Attempt any one part of the following :

(7 × 1 = 7)

- (a) Trace the constraint satisfaction procedure to solve the following cryptarithmic problem :

CROSS
+ROADS

DANGER

- (b) Discuss how constraint satisfaction might work if implemented its search strategy via;
- depth first search
 - breadth first search
 - best first search

5. Attempt any one part of the following :

(7 × 1 = 7)

- (a) Represent the following in partitioned semantic networks :
- Every player kicked a ball.
 - All players like the referee.
 - Andrew believes that there is a fish with tungs.
- (b) Pick a problem area and represent the knowledge in frame based system.

6. Attempt any one part of the following :

(7 × 1 = 7)

- (a) Describe a rational agent function for the modified performance measure that deducts one point for each movement. Does the corresponding agent program require internal state?
- (b) Discuss possible agent designs for the cases in which clean squares can become dirty and the geography of the environment is unknown. Does it make sense for the agent to learn from its experience in these cases? If so, what should it learn.

7. Attempt any one parts of the following :

(7 × 1 = 7)

- (a) Discuss back propagation algorithm for learning in multilayer neural network.
- (b) Explain the concept of forward and backward state space search in detail.