

AMITY SCHOOL OF ENGINEERING & TECHNOLOGY
Artificial Intelligence (ETCS-310)

Semester – VI

Credit - 4

TUTORIAL 1

1. What is Artificial Intelligence? Explain some applications of AI.
2. What do you understand by the term Intelligent Agent?
3. Explain different classes of Intelligent Agents.
4. Which are different performance measures for determining an agent's behavior?
5. Define the following terms :
 - i) Rationality
 - ii) Autonomy
 - iii) Reflex agent
 - iv) Model-based agent
 - v) Goal-based agent
 - vi) Utility-based agent
 - vii) Learning agent
6. Explain the difference between performance measure and utility function measure.
7. a) Can there be more than one agent program that implements a given agent function?
Give an example or show why one is not possible.
b) Given a fixed machine architecture with n bits of storage, how many different possible agent programs are there?
8. For the following agents, develop a PEAS description
 - i) Internet book shopping agent
 - ii) Robot soccer player

TUTORIAL 2

1. Define the following terms :
 - a) State
 - b) State space
 - c) Search tree
 - d) Successor function
 - e) Branching factor
2. Explain why problem formulation must follow goal formulation?
3. Show that that 8-puzzle states are divided into two disjoint states, such that no state in one set can be transformed into a state in the other set by any number of moves.
4. Does a finite space always lead to a finite search tree?
5. Before we can solve a problem using state space search, we must define an appropriate state space. For each of the problems mentioned below, find a good state space representation.
 - a) Water jug
 - b) 8-puzzle
 - c) Traveling salesman
 - d) Monkey and bananas
6. Give an example of a problem for which breadth – first search would work better than depth-first search.
7. Compare the time and space complexity for DFS and BFS.

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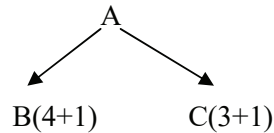
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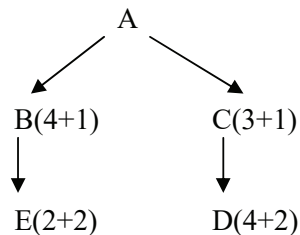
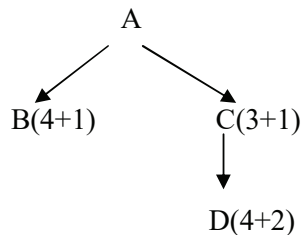
8. Write an algorithm to perform breadth-first search of a problem graph. Make sure your algorithm works properly when a single node is generated at more than one level in the graph.

TUTORIAL 3

1. Which are different informed search strategies. Briefly explain.
2. Solve the 8-puzzle using hill climbing. Find a heuristic function that makes this work.
3. Suppose that the first step of the operation of the best-first search algorithm results in the following situation (a + b means that the value of h at a node is a and the value of g is b):



The second and third steps then results in the following sequence of situations:



- (i) What node will be expanded at the next step?
 - (ii) Can we guarantee that the best solution will be found?
4. What heuristic functions are needed to implement A* search algorithm. Consider the 8 puzzle :
- | | | | | | |
|---------|---|---|-------|---|---|
| 8 | 5 | 6 | 1 | 2 | 3 |
| 1 | 3 | 2 | 4 | 5 | 6 |
| 4 | 7 | | 7 | 8 | |
| Initial | | | final | | |
- Define the A* heuristic functions and draw the corresponding A* search tree.
5. Define a hill climbing function for the above problem. How does hill climbing differ from the A* search algorithm?
 6. When do we use A* algorithm for search process?
 7. Find Heuristic function for 8-puzzle problem.

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TUTORIAL 4

1. What do you understand by logical agents?
2. Explain knowledge based agents in detail.
3. Explain the following in context of propositional logic
 - a) Equivalence
 - b) Validity
 - c) Satisfiability
4. What is wrong with the following argument
Men are widely distributed over the earth.
Socrates is a man.
Therefore, Socrates is widely distributed over the earth.
How should the facts represented by these sentences be represented in logic so that this problem does not arise?
5. Explain resolution and unification.
6. Convert the following WFF into clausal form :
 $\forall P(X) ((\forall Y P(Y) \rightarrow P(f(X,Y))) (\exists Y q(X,Y) \rightarrow P(Y)))$
7. How does resolution operate on variable free and non-variable free clauses?
8. Explain the significance of conjunctive normal form. Translate the following sentence into CNF: “There exists a dog which does not produce milk”.

TUTORIAL 5

1. A problem solving search can proceed either forward or backward. Which factors determine the choice of direction for a particular problem.
2. Consider the facts :
All barbers shave all people who shave themselves.
No barber shaves anyone who shaves himself.
Prove using factor clauses and resolution that: there are no barbers.
3. Consider the facts :
Steve only likes easy courses:
Science courses are hard.
All the courses in the basket weaving department are easy.
BK301 is a basket weaving course.
Use resolution to answer the question, “What course would Steve like?”
4. What problems would be encountered in attempting to represent the following statements in predicate logic? It should be possible to deduce the final statement from the others.
Steve only likes to see Hindi movies.
It is safe to assume a movie is American unless explicitly told otherwise.
The playhouse rarely shows foreign films.
People do not do things that will cause them to be in situations that they do not like.
Steve does not go to the playhouse very often.
5. Trace the execution of unification on the following two clauses :

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$P(x, f(x))$ and $P(f(a), a)$

6. Distinguish between forward and backward chaining in rule based systems.
7. Why it is difficult to make inferences in non-monotonic reasoning as compared to monotonic reasoning. Explain by taking an example.

TUTORIAL 6

1. Differentiate between alpha-beta pruning and Mini-Max Search.
2. How Mini Max procedure be modified to accommodate 4 players rather than 2 mini-max players?
3. Why it is difficult to make inferences in non-monotonic reasoning as compared to monotonic reasoning. Explain by taking an example.
4. Explain conceptual dependency.
5. Pick a concept and demonstrate learning by presenting positive and negative examples of the concept.
6. Explain learning by parameter adjustment and by taking advice.
7. What is Default Reasoning?
8. Give Dempster- Shafer theory making it different from Bayesian belief Networks.

TUTORIAL 7

1. Consider the problem of building a program and this program is provided as input to the child with a set of pairs, each consisting of a sentence and a representation of the meaning of the sentence. Make a program using any learning technique for the above problem.
2. How fuzzy logic is better than Boolean logic in capturing uncertainty.
3. Define a case study of college where student has different learning mechanism to solve problem. Explain mechanism with optimum satisfaction to problem?
4. Explain the difference of genetic operator inversion, crossover and mutation. Which operator do you think is most effective in finding the optimal population in least time?
5. Differentiate between Natural Language Processing and Natural Language Generation..
6. Give a parse tree for the sentence “Tyagi loves the nature”, where the following rules are used :

$S \longrightarrow NP \ VP$
 $NP \longrightarrow N$
 $NP \longrightarrow DET \ N$
 $VP \longrightarrow V \ NP$
 $DET \longrightarrow the$
 $V \longrightarrow loves$
 $N \longrightarrow Tyagi / nature$

7. Explain Phases of Natural Language Processing.
8. Identify the type of ambiguity in each of the following sentences:
 - i. He was not sure that he has taken a drink.
 - ii. Vidushi broke her glasses.
 - iii. I saw the boy with the telescope.

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TUTORIAL 8

1. Give steps for development of Expert System and Explain Inference Engine using fuzzy and Rule based systems taking an example?
2. Explain the main features of MYCIN expert system
3. Describe Dendral expert systems. How do we use Domain exploration, Meta knowledge and Expertise transfer in building expert system?
4. Explain the expert system RI (XCON).
5. Explain the ES development life cycle.
6. Explain Application areas of Expert System and limitations.
7. Differentiate between Abductive reasoning and deductive Reasoning.
8. Explain how we can deal with uncertainty in the development of expert systems.

TUTORIAL 9

1. What is Learning?
2. What do you mean by Rote Learning?
3. What do you mean Learning by Taking Advice?
4. Explain Learning by Parameter Adjustment.
5. Explain Learning by Macro Operators
6. What is Learning by Chunking?
7. Explain Automated Advice Taking.
8. What do you mean by Learning By Example or Inductive Learning?

TUTORIAL 10

1. Explain various approaches used in Non monotonic reasoning.
2. Explain BACON data driven discovery and how it differs from Analogy approach of learning.
3. Explain various types of ambiguities encountered in natural languages. Give example of each type of ambiguity.
4. What is morpheme? What is its role in the language?
5. Explain the concept of inductive learning giving the algorithm.
6. Define Self Explaining System..
7. Explain The Candidate Elimination Algorithm.
8. What is Decision Trees? How will you Build decision trees?