Unit 1

Q1. What is AI? Describe its significance in today's era.

Ans. AI technology is important because it enables human capabilities – understanding, reasoning, planning, communication and perception – to be undertaken by software increasingly effectively, efficiently and at low cost.

The importance of artificial intelligence and its subsequent components have been known for quite a long time now. They are being looked upon as tools and techniques to make this world a better place

important uses of artificial intelligence:

1. In the field of Medical Sciences

here have been various machine learning algorithms and models working efficiently to predict various critical use cases such as determining whether a particular patient has malignant or benign cancer or tumor based on the symptoms and the health records and history.

2. In the Field of Air Transport

involvement of artificial intelligence where the machine is involved in planning the routes, along with flight landing and take-off charts.

3. In the field of Banking and Financial Institutions

The banks' day-to-day tasks such as transactional and financial operations, stock market money and their management, etc. are being worked upon by these machine learning models in a much easier and efficient way.

4. In the Field of Gaming and Entertainment

The bots are always present to play with you, and therefore you are not required to have a second person to play.

Q.2 Differentiate strong and WEAK AI w.r.t. applications or techniques

Ans. This distinction is brought into sharper contrast when we look at the difference between so-called strong AI and weak AI.

The followers of strong AI believe that by giving a computer program sufficient processing power, and by providing it with enough intelligence, one can create a computer that can literally think and is conscious in the same way that a human is conscious.

Many philosophers and Artificial Intelligence researchers consider this view to be false, and even ludicrous. The possibility of creating a robot with emotions and real consciousness is one that is often explored in the realms of science fiction but is rarely considered to be a goal of Artificial Intelligence.

Weak AI, in contrast, is simply the view that intelligent behavior can be modeled and used by computers to solve complex problems. This point of view argues that just because a computer behaves intelligently does not prove that it is actually intelligent in the way that a human is.

Q4. Explain the Chinese room problem ?

Ans . An English-speaking human is placed inside a room. This human does not speak any language other than English and in particular has no ability to read, speak, or understand Chinese. Inside the room with the human are a set of cards, upon which are printed Chinese symbols, and a set of instructions that are written in English.

A story, in Chinese, is fed into the room through a slot, along with a set of questions about the story. By following the instructions that he has, the human is able to construct answers to the questions from the cards with Chinese symbols and pass them back out through the slot to the questioner.

If the system were set up properly, the answers to the questions would be sufficient that the questioner would believe that the room (or the person inside the room) truly understood the story, the questions, and the answers it gave.

Searle's argument is now a simple one. The man in the room does not understand Chinese. The pieces of card do not understand Chinese. The room itself does not understand Chinese, and yet the system as a whole is able to exhibit properties that lead an observer to believe that the system (or some part of it) does understand Chinese.

In other words, running a computer program that behaves in an intelligent way does not necessarily produce understanding, consciousness, or real intelligence.

This argument clearly contrasts with Turing's view that a computer system that could fool a human into thinking it was human too would actually be intelligent

Q.3. Demonstrate the Turing test

Ans . The Turing test, originally called the imitation game by Alan Turing in 1950, is a test of a machine's ability to exhibit intelligent behaviour equivalent to, or indistinguishable from, that of a human.

The interrogator is given access to two individuals, one of whom is a human and the other of whom is a computer. The interrogator can ask the two individuals questions, but cannot directly interact with them. Probably the questions are entered into a computer via a keyboard, and the responses appear on the computer screen.

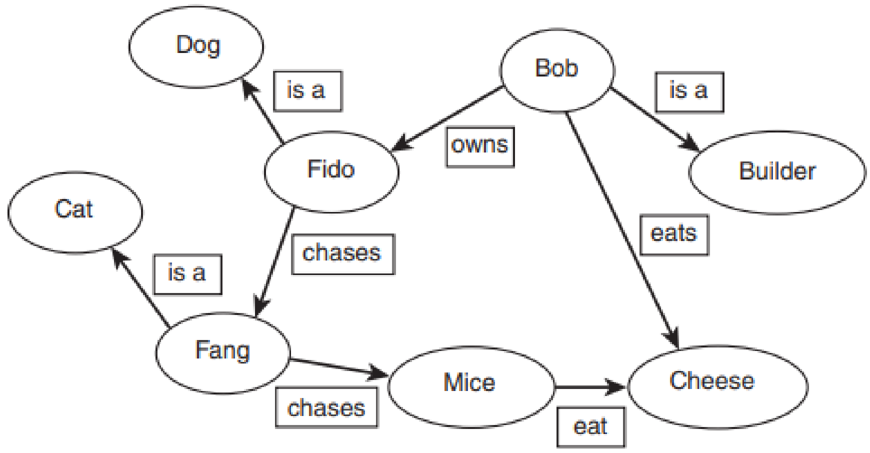
The human is intended to attempt to help the interrogator, but if the computer is really intelligent enough, it should be able to fool the interrogator into being uncertain about which is the computer and which is the human.
The human can give answers such as "I'm the human—the other one is the computer," but of course, so can the computer. The real way in which the human proves his or her humanity is by giving complex answers that a computer could not be expected to comprehend. Of course, the inventors of the truly intelligent computer program would have given their program the ability to anticipate all such complexities.

Q.4 .Describe the steps involved in the AI starting from Knowledge representation to ML

Q.5 Explain Semantic nets.

Ans. A semantic net is a graph consisting of nodes that are connected by edges. The nodes represent objects, and the links between nodes represent relationships between those objects. The links are usually labeled to indicate the nature of the relationship.

A simple example of a semantic net is shown in Figure 3.1.



Note that in this semantic net, the links are arrows, meaning that they have a direction. In this way, we can tell from the diagram that Fido chases Fang.
in our semantic net we have represented some specific individuals, such as Fang, Bob, and Fido, and have also represented some general classes of things, such as cats and dogs. The specific objects are generally referred to as

instances of a particular class. Fido is an instance of the class dog. Bob is an instance of the class Builder.

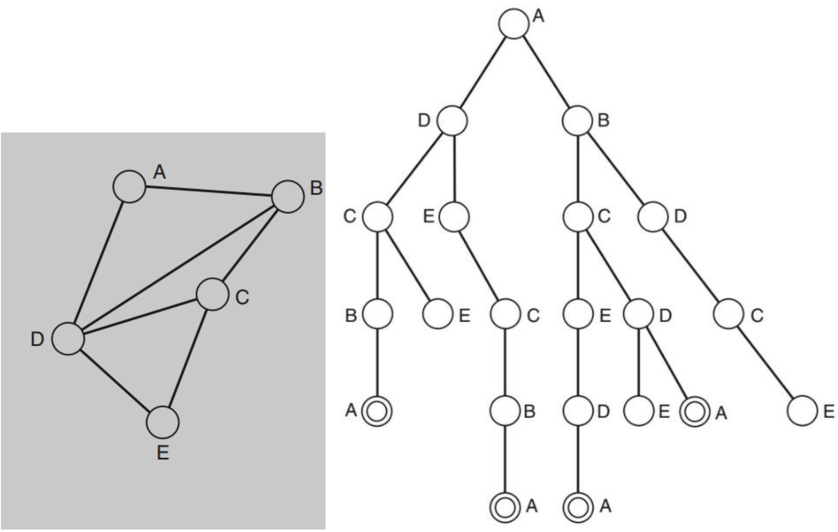
It is a little unclearwhether cheese is a class or an instance of a class. This information would need to be derived by the system that is manipulating the semantic net in some way. For example, the system might have a rule that says "any object that does not have an 'is-a' relationship to a class is considered to represent a class of objects." Rules such as this must be applied with caution and must be remembered when building a semantic net.

An important feature of semantic nets is that they convey meaning. That is to say, the relationship between nodes and edges in the net conveys information about some real-world situation.

Each node in a semantic net has a label that identifies what the node represents. Edges are also labeled. Edges represent connections or relationships between nodes.

Q6. What are Search trees

Ans. A search tree represents the possible paths through a semantic net. Each node in the tree represents a path, with successive layers in the tree representing longer and longer paths. Example:



Solving the Missionaries and Cannibals problem involves searching the search tree :-

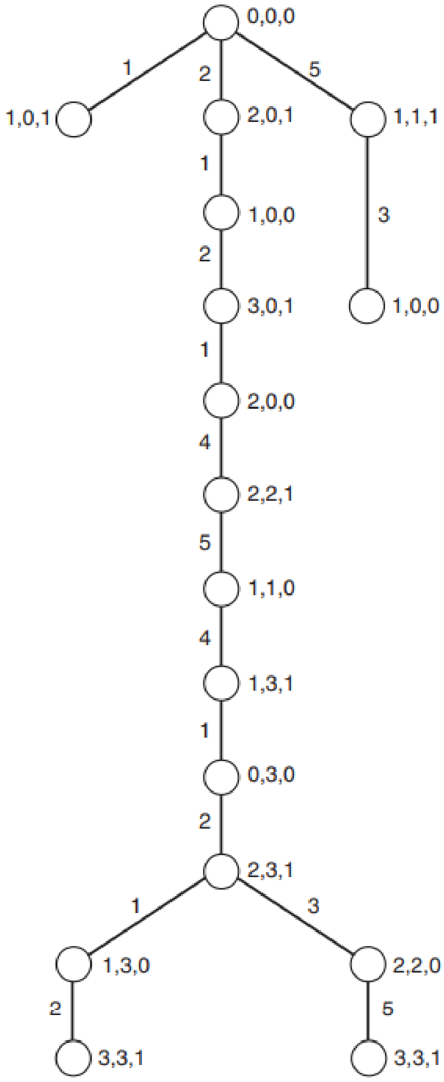


Figure 3.7
Search tree without cycles

Q7. Design a decision tree that enables you to identify an item from a category in which you are interested (e.g., cars, animals, pop singers, films, etc.).

Q9.
Combinatorial explosion
Ans. The search tree for a Traveling Salesman problem becomes unmanageably large as the number of cities increases. Many problems have the property that as the number of individual items being considered increases, the number of possible paths

in the search tree increases exponentially, meaning that as the problem gets larger, it becomes more and more unreasonable to expect a computer program to be able to solve it. This problem is known as combinatorial explosion because the amount of work that a program needs to do to solve the problem seems to grow at an explosive rate, due to the possible combinations it must consider.

Problem reduction

Ans. In many cases we find that a complex problem can be most effectively solved by breaking it down into several smaller problems. If we solve all of those smaller subproblems, then we have solved the main problem. This approach to problem solving is often referred to as goal reduction because it involves considering the ultimate goal of solving the problem in a way that involves generating subgoals for that goal.

For example, to solve the Towers of Hanoi problem with n disks, it turns out that the first step is to solve the smaller problem with n - 1 disks

Figure 3.13
The starting state of the Towers of Hanoi problem with four disks

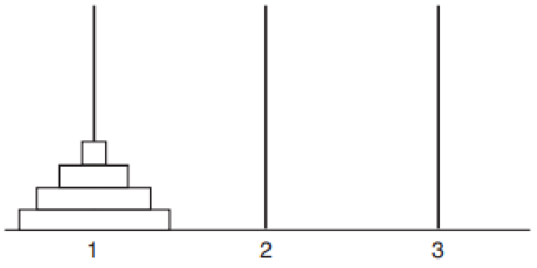
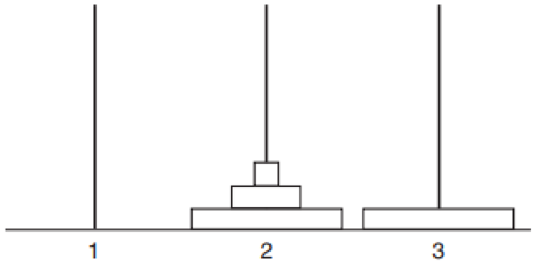


Figure 3.14
Towers of Hanoi problem of size 4 reduced to a problem of size 3 by first moving the largest disk from peg 1 to peg 3



For example, let us examine the Towers of Hanoi with four disks, whose starting state is shown in Figure 3.13.

To solve this problem, the first step is to move the largest block from peg 1 to peg 3. This will then leave a Towers of Hanoi problem of size 3, as shown in Figure 3.14, where the aim is to move the disks from peg 2 to peg 3. Because the disk that is on peg 3 is the largest disk, any other disk can be placed on top of it, and because it is in its final position, it can effectively be ignored.

In this way, a Towers of Hanoi problem of any size n can be solved by first moving the largest disk to peg 3, and then applying the Towers of Hanoi solution to the remaining disks, but swapping peg 1 and peg 2.

Goal Trees:

A goal tree (also called an and-or tree) is a form of semantic tree used to represent problems that can be broken down in this way. We say that the solution to the problem is the goal, and each individual step along the way is a subgoal.

Each node in a goal tree represents a subgoal, and that node's children are the subgoals of that goal. Some goals can be achieved only by solving all of its subgoals. Such nodes on the goal tree are and-nodes, which represent and-goals.

In other cases, a goal can be achieved by achieving any one of its subgoals. Such goals are or-goals and are represented on the goal tree by or-nodes.

An and-node is shown by drawing an arc across the arcs that join it to its subgoals (children). Or-nodes are not marked in this way. The main difference between goal trees and normal search trees is that in order to solve a problem using a goal tree, a number of subproblems (in some cases, all subproblems) must be solved for the main problem to be solved. Hence, leaf nodes are called success nodes rather than goal nodes because each leaf node represents success at a small part of the problem.

Success nodes are always and-nodes. Leaf nodes that are or-nodes are impossible to solve and are called failure nodes.

Goal tree for tower of Hanoi problem :

Figure 3.13
The starting state of the Towers of Hanoi problem with four disks

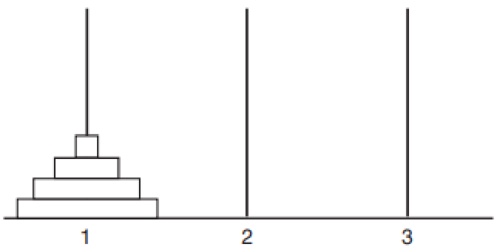
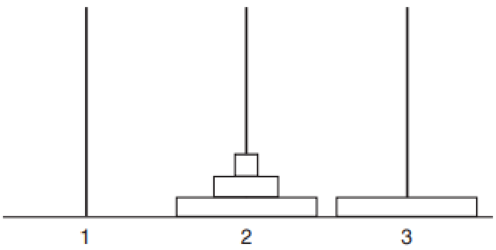


Figure 3.14
Towers of Hanoi problem of size 4 reduced to a problem of size 3 by first moving the largest disk from peg 1 to peg 3



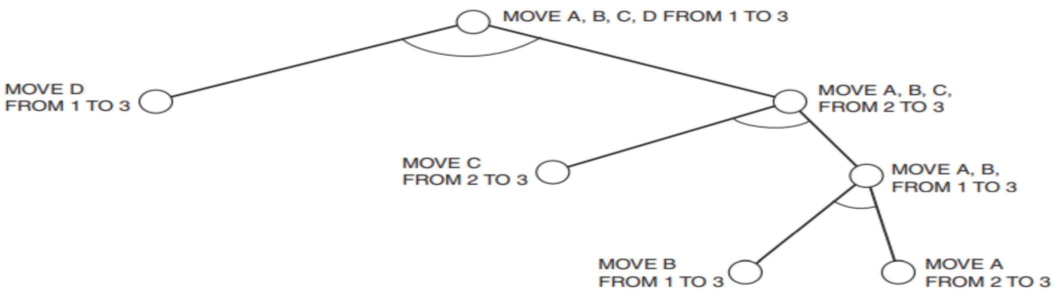


Figure 3.15
Goal tree for Towers of Hanoi problem with four disks

A goal tree for the Towers of Hanoi problem with four disks is shown in Figure 3.15. The root node represents the main goal, or root goal, of the problem, which is to move all four disks from peg 1 to peg 3. In this tree, we have represented the four disks as A,B,C, and D, where A is the smallest disk, and D is the largest. The pegs are numbered from 1 to 3. All of the nodes in this tree are and-nodes. This is true of most problems where there is only one reasonable solution.

Figure 3.15 is somewhat of an oversimplification because it does not explain how to solve each of the subgoals that is presented. To produce a system that could solve the problem, a larger goal tree that included additional subgoals would be needed.

Q10. Design a decision tree that enables you to identify an item from a category in which you are interested (e.g., cars, animals, pop singers, films, etc.