JEC GROUP OF COLLEGES, KUKAS

1st Midterm paper Solutions

Subject: Artificial Intelligence

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Branch: Electrical Engineering (EEE)

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UNIT-I

Q.1. What is artificial intelligence? Explain how an AI system is different from a conventional computing system?

Ans1. Artificial intelligence (AI) is the simulation of human intelligence processes by machines, especially computer systems. These processes include learning (the acquisition of information and rules for using the information), reasoning (using rules to reach approximate or definite conclusions) and self-correction.

Conventional systems are rule based systems. Rules are clearly defined and implemented in the programming language as to how the system should function and behave in certain condition.

AI systems on the other hand are observation and learning based systems. They observe the surrounding ecosystem and the environment, the past data and how the system has responded in past to certain data. Based on this data, a pattern is established, rules are derived automatically and then systems follow these rules. The rules may evolve overtime based on the new data that system is constantly accumulating.

The conventional computing functions logically with a set of rules and calculations while the neural computing can function via images, pictures, and concepts. Conventional computing is often unable to manage the variability of data obtained in the real world. On the other hand, neural computing, like our own brains, is well suited to situations that have no clear algorithmic solutions and are able to manage noisy imprecise data. This allows them to excel in those areas that conventional computing often finds difficult.

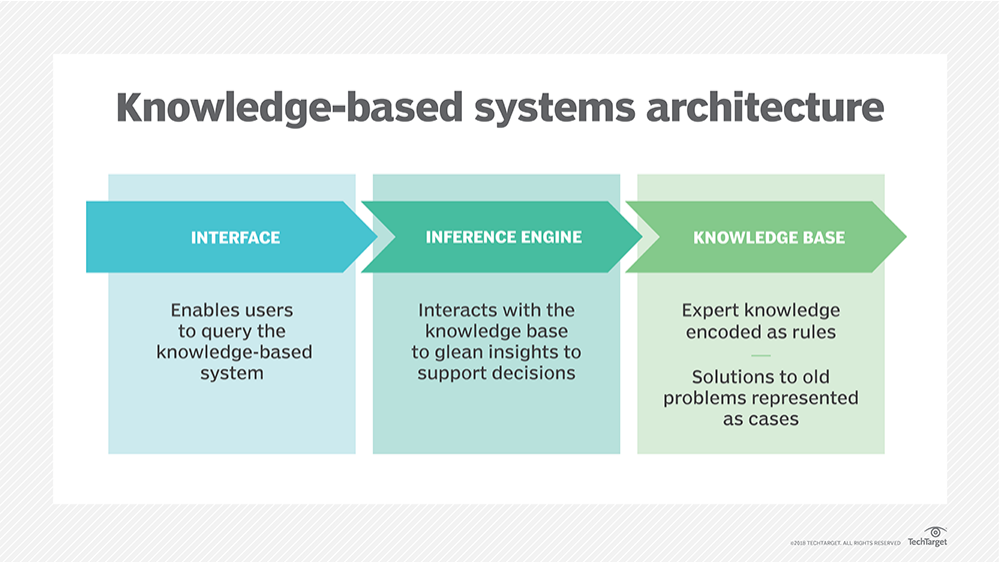
OR

Q.1. What is knowledge based Expert systems? Discuss the use of KBES for artificial intelligence?

Ans 1. A knowledge-based system (KBS) is a form of artificial intelligence (AI) that aims to capture the knowledge of human experts to support decision-making. Examples of knowledge-based systems include expert systems, which are so called because of their reliance on human expertise.

The typical architecture of a knowledge-based system, which informs its problem-solving method, includes a knowledge base and an inference engine. The knowledge base contains a collection of information in a given field -- medical diagnosis, for example. The inference engine deduces insights from the information housed in the knowledge base. Knowledge-based systems also include an interface through which users query the system and interact with it.

A knowledge-based system may vary with respect to its problem-solving method or approach. Some systems encode expert knowledge as rules and are therefore referred to as rule-based systems. Another approach, case-based reasoning, substitutes cases for rules. Cases are essentially solutions to existing problems that a case-based system will attempt to apply to a new problem.



UNIT II

Q.2. (A) Explain the algorithm for hill climbing?

(B) What is forward and backward chaining algorithm?

Ans.2 (A) Hill climbing is a variety of depth-first (generate - and - test) search. A feedback is used here to decide on the direction of motion in the search space. In the depth-first search, the test function will merely accept or reject a solution.

But in hill climbing the test function is provided with a heuristic function which provides an estimate of how close a given state is to goal state.

Hill climbing is a mathematical optimization technique which belongs to the family of local search. It is an iterative algorithm that starts with an arbitrary solution to a problem, then attempts to find a better solution by incrementally changing a single element of the solution.

If the change produces a better solution, an incremental change is made to the new solution, repeating until no further improvements can be found.

For example, hill climbing can be applied to the travelling salesman problem. It is easy to find an initial solution that visits all the cities but will be very poor compared to the optimal solution.

The algorithm starts with such a solution and makes small improvements to it, such as switching the order in which two cities are visited.

Two variations of hill climbing are:

1. Simple hill climbing:
2. Steepest Ascent Hill Climbing.

Simple hill climbing: It is simple way to implement hill climbing:

Algorithm:

1. Evaluate the initial state. If it is a goal state, then return and quit; otherwise make it a current state and goto Step 2.
2. Loop until a solution is found or there are no new operators left to be applied.

a. Select and apply a new operator

b. Evaluate the new state:

i. If it is a goal state, then return and quit.

ii. If it is better than current state then make it a new current state.

iii. If it is not better than the current state then continue the loop, go to Step 2.

Ans B.

Forward chaining starts with the known facts and asserts new facts. Backward chaining starts with goals, and works backward to determine what facts must be asserted so that the goals can be achieved. Deductive inference rule: Forward Chaining: Conclude from "A" and "A implies B" to "B".

Forwardchaining:

Forward Chaining is one of the two main methods of reasoning when using an inference engine and can be described logically as repeated application of *modus ponens*. Forward chaining is a popular implementation strategy for expert systems, business and production rule systems.Forward chaining starts with the available data and uses inference rules to extract more data (from an end user, for example) until a goal is reached. An inference engine using forward chaining searches the inference rules until it finds one where the antecedent (If clause) is known to be true. When such a rule is found, the engine can conclude, or infer, the consequent (Then clause), resulting in the addition of new information to its data.

Backward chaining (or backward reasoning) is an inference method that can be described (in lay terms) as working backward from the goal(s). It is used in automated theorem provers, inference engines, proof assistants and other artificial intelligence applications.

In game theory, its application to (simpler) subgames in order to find a solution to the game is called backward induction. In chess, it is called retrograde analysis, and it is used to generate tablebases for chess endgames for computer chess.
Backward chaining is implemented in logic programming by SLD resolution. Both rules are based on the modus pollens inference rule. It is one of the two most commonly used methods of reasoning with inference rules and logical implications – the other is forward chaining. Backward chaining systems usually employ a depth-first search strategy.

OR

Q.2. Write four properties a good system should possess for the knowledge representation in a particular domain?

Ans.2 Knowledge representation is probably, the most important ingredient for developing an AI. A representation is a layer between information accessible from outside world and high level thinking processes. Without knowledge representation it is impossible to identify what thinking processes are, mainly because representation itself is a substratum for a thought.

The following properties should be possessed by a knowledge representation system.

a. **Representational Adequacy:** It is the ability to represent the required knowledge.

b. **Inferential Adequacy:** It is the ability to manipulate the knowledge represented to produce new knowledge corresponding to that inferred from the original.

c. **Inferential Efficiency:** The ability to direct the inferential mechanisms into the most productive directions by storing appropriate guides.

d. **Acquisitional Efficiency:** The ability to acquire new knowledge using automatic methods wherever possible rather than reliance on human intervention.