

# **1) What do you understand by Artificial Intelligence?**

Artificial intelligence is computer science technology that emphasizes creating intelligent machine that can mimic human behaviour. Here Intelligent machines can be defined as the machine that can behave like a human, think like a human, and also capable of decision making.

With artificial intelligence, we do not need to pre-program the machine to perform a task; instead, we can create a machine with the programmed algorithms, and it can work on its own.

## **2) Why do we need Artificial Intelligence?**

The goal of Artificial intelligence is to create intelligent machines that can mimic human behaviour. We need AI for today's world to solve complex problems, make our lives more smoothly by automating the routine work, saving the manpower, and to perform many more other tasks.

## **3) Give some real-world applications of AI.**

There are various real-world applications of AI, and some of them are given below:

- Google Search Engine
- Ride-sharing Applications
- Spam Filters in Email
- Social Networking
- Product recommendations:

#### 4) How Artificial intelligence, Machine Learning, and Deep Learning differ from each other?

The difference between AI, ML, and Deep Learning is given in the below table:

Artificial Intelligence	Machine Learning	Deep Learning
The term Artificial intelligence was first coined in the year 1956 by John McCarthy.	The term ML was first coined in the year 1959 by Arthur Samuel.	The term DL was first coined in the year 2000 Igor Aizenberg.
It is a technology that is used to create intelligent machines that can mimic human behavior.	It is a subset of AI that learns from past data and experiences.	It is the subset of machine learning and AI that is inspired by the human brain cells, called neurons, and imitates the working of the human brain.
AI completely deals with structured, semi-structured data.	ML deals with structured and semi-structured data.	Deep learning deals with structured and unstructured data.
It requires a huge amount of data to work.	It can work with less amount of data compared to deep learning and AI.	It requires a huge amount of the data compared to the ML.
The goal of AI is to enable the machine to think without any human intervention.	The goal of ML is to enable the machine to learn from past experiences.	The goal of deep learning is to solve the complex problems as the human brain does, using various algorithms.

## **5) Mention the difference between statistical AI and Classical AI ?**

Statistical AI is more concerned with “inductive” thought like given a set of pattern, induce the trend etc. While, classical AI, on the other hand, is more concerned with “deductive” thought given as a set of constraints, deduce a conclusion etc.

## **6) What are the different domains/Subsets of AI?**

AI covers lots of domains or subsets, and some main domains are given below:

- Machine Learning
- Deep Learning
- Neural Network
- Expert System

## **7) Explain the term "Q-Learning."**

Q-learning is a popular algorithm used in reinforcement learning. It is based on the Bellman equation. In this algorithm, the agent tries to learn the policies that can provide the best actions to perform for maximising the rewards under particular circumstances. The agent learns these optimal policies from past experiences. In Q-learning, the Q is used to represent the quality of the actions at each state, and the goal of the agent is to maximize the value of Q.

## **8) Which programming language is used for AI?**

Below are the top five programming languages that are widely used for the development of Artificial Intelligence:

- Python
- Java

- Lisp
- R
- Prolog

## **9) What is the intelligent agent in AI, and where are they used?**

The intelligent agent can be any autonomous entity that perceives its environment through the sensors and act on it using the actuators for achieving its goal.

These Intelligent agents in AI are used in the following applications:

- Information Access and Navigations such as Search Engine
- Repetitive Activities
- Domain Experts
- Chat bots, etc.

## **10) What is Markov's Decision process?**

The solution for a reinforcement learning problem can be achieved using the Markov decision process or MDP. Hence, MDP is used to formalize the RL problem. It can be said as the mathematical approach to solve a reinforcement learning problem. The main aim of this process is to gain maximum positive rewards by choosing the optimum policy.

MDP has four elements, which are:

- A set of finite states  $S$
- A set of finite actions  $A$
- Rewards
- Policy  $P_a$

In this process, the agent performs an action  $A$  to take a transition from state  $S_1$  to  $S_2$  or from the start state to the end state, and while doing these actions, the agent gets some rewards. The series of actions taken by the agent can be defined as the policy.

## **11) What do you understand by the reward maximization?**

Reward maximization term is used in reinforcement learning, and which is a goal of the reinforcement learning agent. In RL, a reward is a positive feedback by taking action for a transition from one state to another. If the agent performs a good action by applying optimal policies, he gets a reward, and if he performs a bad action, one reward is subtracted. The goal of the agent is to maximize these rewards by applying optimal policies, which is termed as reward maximization.

## **12) Explain the Hidden Markov model.**

Hidden Markov model is a statistical model used for representing the probability distributions over a chain of observations. In the hidden Markov model, hidden defines a property that it assumes that the state of a process generated at a particular time is hidden from the observer, and Markov defines that it assumes that the process satisfies the Markov property. The HMM models are mostly used for temporal data. The HMM is used in various applications such as reinforcement learning, temporal pattern recognition, etc.

### **13) What is Strong AI, and how is it different from the Weak AI?**

**Strong AI:** Strong AI is about creating real intelligence artificially, which means a human-made intelligence that has sentiments, self-awareness, and emotions similar to humans. It is still an assumption that has a concept of building AI agents with thinking, reasoning, and decision-making capabilities similar to humans.

**Weak AI:** Weak AI is the current development stage of artificial intelligence that deals with the creation of intelligent agents and machines that can help humans and solve real-world complex problems. Siri and Alexa are examples of Weak AI programs.

### **14) Give a brief introduction to the Turing test in AI?**

Turing test is one of the popular intelligence tests in Artificial intelligence. The Turing test was introduced by Alan Turing in the year 1950. It is a test to determine that if a machine can think like a human or not. According to this test, a computer can only be said to be intelligent if it can mimic human responses under some particular conditions.

In this test, three players are involved, the first player is a computer, the second player is a human responder, and the third player is the human interrogator, and the interrogator needs to find which response is from the machine on the basis of questions and answers.

## **15) Which assessment is used to test the intelligence of the machine?**

Turing Test.

## **16) What is NLP? What are the various components of NLP?**

NLP stands for Natural Language Processing, which is a branch of artificial intelligence. It enables machines to understand, interpret, and manipulate the human language.

Components of NLP:

There are mainly two components of Natural Language processing, which are given below:

### **1. Natural Language Understanding (NLU):**

It involves the below tasks:

- To map the input to useful representations.
- To analyze the different aspects of the language.

### **2. Natural Language Generation (NLG)**

- Text Planning
- Sentence Planning
- Text Realization

## **17) What are the different components of the Expert System?**

An expert system mainly contains three components:

1. **User Interface:** It enables a user to interact or communicate with the expert system to find the solution for a problem.
2. **Inference Engine:** It is called the main processing unit or brain of the expert system. It applies different inference rules to the knowledge base to draw a conclusion from it. The

system extracts the information from the KB with the help of an inference engine.

3. Knowledge Base: The knowledge base is a type of storage area that stores the domain-specific and high-quality knowledge.

## **18) What is the use of computer vision in AI?**

Computer vision is a field of Artificial Intelligence that is used to train the computers so that they can interpret and obtain information from the visual world such as images. Hence, computer vision uses AI technology to solve complex problems such as image processing, object detections, etc.

## **19) Explain the minimax algorithm along with the different terms.**

Minimax algorithm is a backtracking algorithm used for decision making in game theory. This algorithm provides the optimal moves for a player by assuming that another player is also playing optimally.

This algorithm is based on two players, one is called MAX, and the other is called the MIN.

Following terminologies that are used in the Minimax Algorithm:

- Game tree: A tree structure with all possible moves.
- Initial State: The initial state of the board.
- Terminal State: Position of the board where the game finishes.
- Utility Function: The function that assigns a numeric value for the outcome of the game.



## **20) What is game theory? How is it important in AI?**

Game theory is the logical and scientific study that forms a model of the possible interactions between two or more rational players. Here rational means that each player thinks that others are just as rational and have the same level of knowledge and understanding. In the game theory, players deal with the given set of options in a multi-agent situation, it means the choice of one player affects the choice of the other or opponent players.

Game theory and AI are much related and useful to each other. In AI, the game theory is widely used to enable some of the key capabilities required in the multi-agent environment, in which multiple agents try to interact with each other to achieve a goal.

Different popular games such as Poker, Chess, etc., are the logical games with the specified rules. To play these games online or digitally, such as on Mobile, laptop, etc., one has to create algorithms for such games. And these algorithms are applied with the help of artificial intelligence.

## **21) What are some misconceptions about AI?**

There are lots of misconceptions about artificial intelligence since starting its evolution. Some of these misconceptions are given below:

- AI does not require humans
- AI is dangerous for humans
- AI has reached its peak stage
- AI will take your job
- AI is new technology

## **22) What is a Chatbot?**

A chatbot is Artificial intelligence software or agent that can simulate a conversation with humans or users using Natural language processing. The conversation can be achieved through an application, website, or messaging apps. These chatbots are also called as the digital assistants and can interact with humans in the form of text or through voice.

The AI chatbots are broadly used in most businesses to provide 24\*7 virtual customer support to their customers, such as HDFC Eva chatbot, Vainubot, etc.

## **23) What is knowledge representation in AI?**

Knowledge representation is the part of AI, which is concerned with the thinking of AI agents. It is used to represent the knowledge about the real world to the AI agents so that they can understand and utilize this information for solving the complex problems in AI.

Following elements of Knowledge that are represented to the agent in the AI system:

- Objects
- Events
- Performance
- Meta-Knowledge
- Facts
- Knowledge-base

## **24) What are the various techniques of knowledge representation in AI?**

Knowledge representation techniques are given below:

- Logical Representation
- Semantic Network Representation
- Frame Representation
- Production Rules

## **25) Which programming language is not generally used in AI, and why?**

Perl Programming language is not commonly used language for AI, as it is the scripting language.

## **26) What is reinforcement learning?**

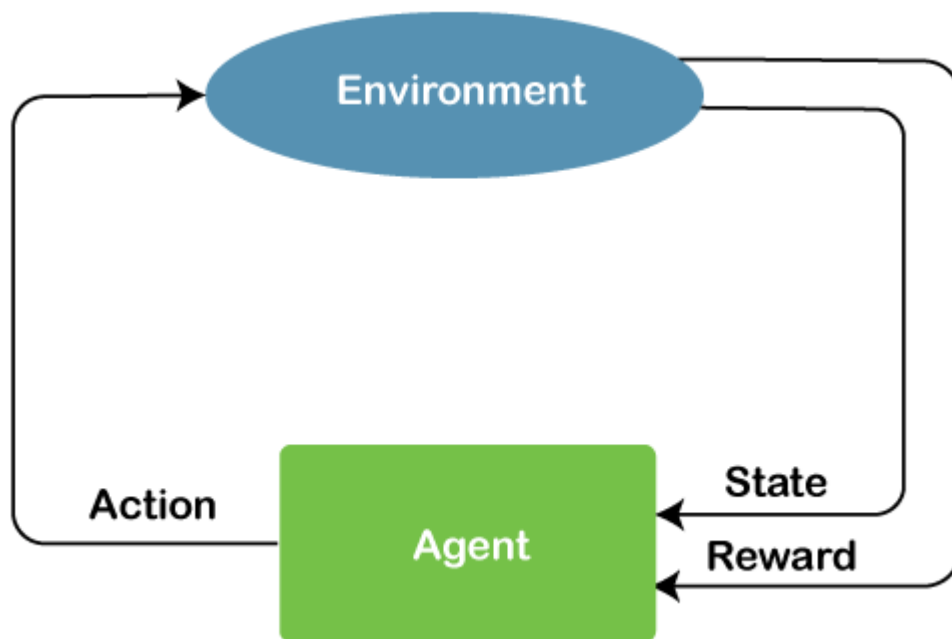
Reinforcement learning is a type of machine learning. In this, an agent interacts with its environment by producing actions, and learn with the help of feedback. The feedback is given to the agent in the form of rewards, such as for each good action, he gets a positive reward, and for each bad action, he gets a negative reward. There is no any labelled data or supervision is provided to the agent. In RL, the agent continuously does three things(performing actions, changing state, and getting the feedback) to explore the environment.

The popular reinforcement learning algorithms are:

- Q-Learning
- SARSA(State Action Reward State Action)
- Deep Q Neural Network

## **27) How does RL work?**

The working of reinforcement learning can be understood by the below diagram:



The RL-based system mainly consists of the following components:

- **Environment:** The environment is the surrounding of the agent, where he needs to explore and act upon.
- **Agent:** The agent is the AI program that has sensors and actuators and the ability to perceive the environment.
- **State:** It is the situation that is returned by the environment to the agent.
- **Reward:** The feedback received to the agent after doing each action.

In RL, the agent interacts with the environment in order to explore it by doing some actions. On each action, the state of agent gets changed or sometimes remains the same, and based on the type of action, and he gets a reward. The reward is feedback, which may be negative or positive based on the action.

The goal of the agent is to maximize the positive reward and to achieve the goal of the problem.

## **28) What are the different areas where AI has a great impact?**

Following are some areas where AI has a great impact:

- Autonomous Transportation
- Education-system powered by AI.
- Healthcare
- Predictive Policing
- Space Exploration
- Entertainment, etc.

## **29) What are the different software platforms for AI development?**

1. Google Cloud AI platform
2. Microsoft Azure AI platform
3. IBM Watson
4. TensorFlow
5. Infosys Nia
6. Rainbird
7. Dialogflow

## **30) Explain rational agents and rationality?**

A rational agent is an agent that has clear preferences, model uncertainty, and that performs the right actions always. A rational agent is able to take the best possible action in any situation.

Rationality is a status of being reasonable and sensible with a good sense of judgement.

## **31) What is tensor flow, and how it is used in AI?**

Tensor flow is the open-source library platform developed by the Google Brain team. It is a math library used for several machine

learning applications. With the help of tensor flow, we can easily train and deploy the machine learning models in the cloud.

### **32) What is a market-basket analysis?**

The market-basket analysis is a popular technique to find the associations between the items. It is frequently used by big retailers in order to get maximum profit. In this approach, we need to find combinations of items that are frequently bought together.

For example, if a person buys bread, there are most of the chances that he will buy butter also. Hence, understanding such correlations can help retailers to grow their business by providing relevant offers to their customers.

### **33) How can AI be used in fraud detection?**

The artificial intelligence can be broadly helpful in fraud detection using different machine learning algorithms, such as supervised and unsupervised learning algorithms. The rule-based algorithms of Machine learning helps to analyse the patterns for any transaction and block the fraudulent transactions.

Below are the steps used in fraud detection using machine learning:

- Data extraction
- Data Cleaning
- Data exploration & analysis
- Building Models

### **34) Give the steps for A\* algorithm?**

A\* algorithm is the popular form of the Best first search. It tries to find the shortest path using the heuristic function with the cost

function to reach the end node. The steps for A\* algorithms are given below:

**Step 1:** Put the first node in the OPEN list.

**Step 2:** Check if the OPEN list is empty or not; if the list is empty, then return failure and stops.

**Step 3:** Select the node from the OPEN list which has the smallest value of evaluation function ( $g+h$ ), if node  $n$  is goal node then return success and stop, otherwise

**Step 4:** Expand node  $n$  and generate all of its successors, and put  $n$  into the closed list. For each successor  $n'$ , check whether  $n'$  is already in the OPEN or CLOSED list; if not, then compute evaluation function for  $n'$  and place into Open list.

**Step 5:** Else if node  $n'$  is already in OPEN and CLOSED list, then it should be attached to the back pointer, which reflects the lowest  $g(n')$  value.

**Step 6:** Return to Step 2.

### **35) What is the inference engine, and why it is used in AI?**

In artificial intelligence, the inference engine is the part of an intelligent system that derives new information from the knowledge base by applying some logical rules.

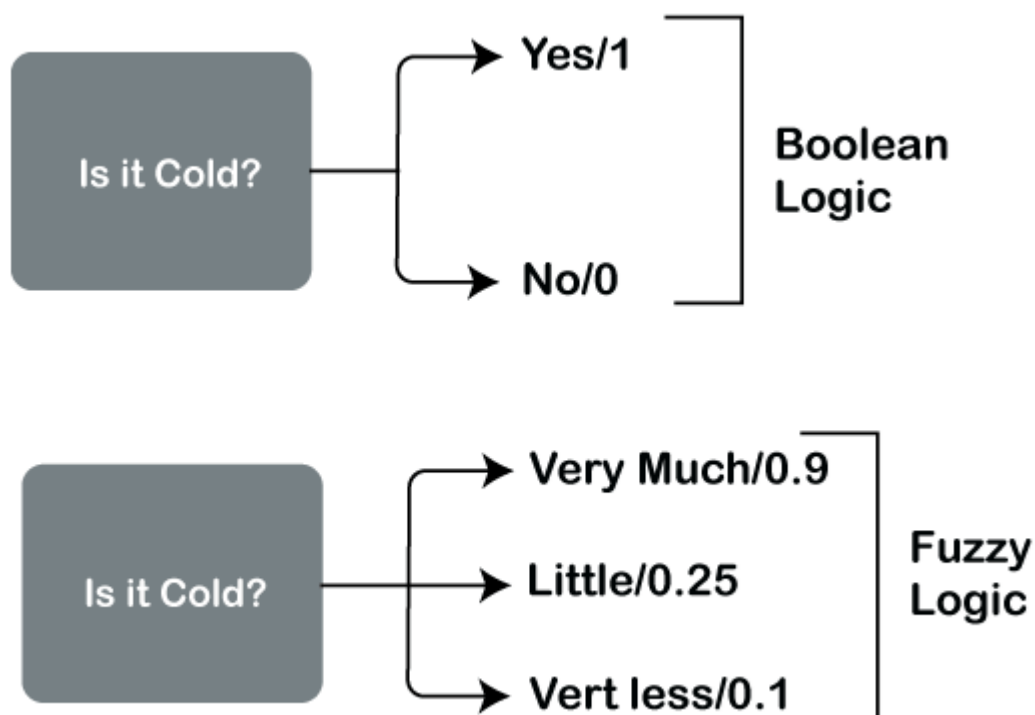
It mainly works in two modes:

- **Backward Chaining:** It begins with the goal and proceeds backward to deduce the facts that support the goal.
- **Forward Chaining:** It starts with known facts, and asserts new facts.

### 36) What do you understand by the fuzzy logic?

Fuzzy logic is a method of reasoning applied to the AI, which resembles human reasoning. Here the word "fuzzy" defines things that are not clear, it means the situations where it is difficult to decide if the state is True or False. It involves all the possibilities that occur between Yes and NO.

The below diagram shows the difference between fuzzy logic and Boolean logic



Since it resembles human reasoning, hence it can be used in neural networks.

### 37) What is a Bayesian network, and why is it important in AI?

Bayesian networks are the graphical models that are used to show the probabilistic relationship between a set of variables. It is a directed cycle graph that contains multiple edges, and each edge represents a conditional dependency.



Bayesian networks are probabilistic, because these networks are built from a probability distribution, and also use probability theory for prediction and anomaly detection. It is important in AI as it is based on Bayes theorem and can be used to answer the probabilistic questions.

### **38) What is a heuristic function, and where is it used?**

The heuristic function is used in Informed Search, and it finds the most promising path. It takes the current state of the agent as its input and produces the estimation of how close the agent is from the goal. The heuristic method, however, might not always give the best solution, but it guaranteed to find a good solution in a reasonable time. Heuristic function estimates how close a state is to the goal. It is represented by  $h(n)$ , and it calculates the cost of an optimal path between the pair of states. The value of the heuristic function is always positive.

Admissibility of the heuristic function is given as:

$$h(n) \leq h^*(n)$$

Here  $h(n)$  is heuristic cost, and  $h^*(n)$  is the estimated cost. Hence heuristic cost should be less than or equal to the estimated cost.

### **39) Which search method takes less memory?**

The “depth first search” method takes less memory.

### **40) Which is the best way to go for Game playing problem?**

Heuristic approach is the best way to go for game playing problem, as it will use the technique based on intelligent guesswork. For example, Chess between humans and computers

as it will use brute force computation, looking at hundreds of thousands of positions.

#### **41) A\* algorithm is based on which search method?**

A\* algorithm is based on best first search method, as it gives an idea of optimization and quick choose of path, and all characteristics lie in A\* algorithm.

#### **42) What is “Generality” in AI?**

Generality is the measure of ease with which the method can be adapted to different domains of application.

#### **43) What is a top-down parser?**

A top-down parser begins by hypothesizing a sentence and successively predicting lower level constituents until individual pre-terminal symbols are written.

#### **44) Mention the difference between breadth first search and best first search in artificial intelligence?**

These are the two strategies which are quite similar. In best first search, we expand the nodes in accordance with the evaluation function. While, in breadth first search a node is expanded in accordance to the cost function of the parent node.

#### **45) What is FOPL stands for and explain its role in Artificial Intelligence?**

FOPL stands for First Order Predicate Logic, Predicate Logic provides

- a) A language to express assertions about certain “World”
- b) An inference system to deductive apparatus whereby we may draw conclusions from such assertion
- c) A semantic based on set theory

**46) What does the language of FOPL consists of**

- a) A set of constant symbols
- b) A set of variables
- c) A set of predicate symbols
- d) A set of function symbols
- e) The logical connective
- f) The Universal Quantifier and Existential Qualifier
- g) A special binary relation of equality

**47) Which is the most straight forward approach for planning algorithm?**

State space search is the most straight forward approach for planning algorithm because it takes account of everything for finding a solution.

**48) In ‘Artificial Intelligence’ where you can use the Bayes rule?**

In Artificial Intelligence to answer the probabilistic queries conditioned on one piece of evidence, Bayes rule can be used.

#### **49) For building a Bayes model how many terms are required?**

For building a Bayes model in AI, three terms are required; they are one conditional probability and two unconditional probability.

#### **50) What is alternate, artificial, compound and natural key?**

**Alternate Key:** Excluding primary keys all candidate keys are known as Alternate Keys.

**Artificial Key:** If no obvious key either stands alone or compound is available, then the last resort is to, simply create a key, by assigning a number to each record or occurrence. This is known as artificial key.

**Compound Key:** When there is no single data element that uniquely defines the occurrence within a construct, then integrating multiple elements to create a unique identifier for the construct is known as Compound Key.

**Natural Key:** Natural key is one of the data element that is stored within a construct, and which is utilized as the primary key.