

Assignment - 1

Introduction to AI

AI is a branch of CS that deals with the creation of intelligent machines that can think, learn & perform tasks that typically require human intelligence. Such as visual perception, speech recognition, decision making, and language translation.

- AI systems are designed to process large amounts of data, identify patterns & make decisions based on those patterns.
- AI got importance in fields like healthcare, finance, transportation etc.
- potential applications are huge & some of them are autonomous vehicle, personalized medicine, fraud detection & chatbots.

Problem Formulation in AI

It is a critical step in developing an AI system. It involves defining the problem that the AI system is designed to solve, specifying the input & output of the system, & identifying the constraints & assumptions that will guide the design of the system.

4 main steps involved are:

Define the problem: first of all we have to define the problem that the AI system

is intended to solve. This includes identifying the goal & determining I/P & O/P for the same.

Specify the I/P & O/P: after defining the problem we have to find suitable I/P & O/P. This includes the type of data used or produced as O/P. for ex: I/P could have text or image while O/P could include a decision or recommendation.

Design the system: Based on the above condition & constraints associated with them, the AI system can be designed. This involves selecting appropriate machine learning model, designing a neural network or developing a rule based system.

Problem formulation process is an iterative process & design of AI system may change as new info becomes available. and also must ensure that the AI system is designed ethically.

→ Concept of Production systems in AI.

These are rule based system that is commonly use in AI. it consists of set of rules, that are applied to a set of data to arrive at a conclusion.

- A typical rule is 'if x is true, then do y ', & are organised into a hierarchy. with

general rules at the top & specific rules at the bottom.

→ Production systems are flexible, i.e., they can be modified as new data becomes available. which allows them to adapt to changing circumstances. & are also easy to implement.

However these too have some limitations. i.e., they work very well with the simpler problems & struggle with complex tasks. They become prone to errors if the rules are not carefully/ clearly defined or if the system is not maintained properly.

Overall, these are an important tool in the field of AI, and are widely used in many different applications. By combining simple rules & data, they can be used to automate a wide range of decision-making processes.

→ Control strategies in AI

These are the methods used to regulate the behaviour of AI system in order to achieve a desired outcome. Some common control strategies are.

1) Feedback control: using feedbacks from the system's env. to adjust its movement in order to behavior. For example: a

A robot may use feedback from its sensors to adjust its movement in order to avoid obstacles.

2) Goal driven control : setting up a specific goal for the system to achieve & adjusting its behavior accordingly. for ex: An autonomous adjusts its path so as to reach a fixed destination.

3) Rule-based control :- setting up of rules to govern the system's behavior. for ex: an ai doctor may identify a disease based on symptoms.

4) Model-based control :- uses mathematical model of the system's env. to predict the outcomes of different actions & adjust its behavior accordingly. for ex: a drone may use wind patterns to gain stability.

Overall, the choice of control strategy will depend on the specific application & the goal of the system. By carefully selecting & implementing the right control strategy, it is possible to create AI systems that are both effective & safe.

→ Some Search strategies used in AI.

Search strategies in AI refer to the methods used to find a solution to a problem by exploring a set of possible options. Some common search strategies are:

BFS: this involves exploring all the possible things each branch of the search tree before undertaking exploring other branches

2) BFS: This involves exploring all nodes at the current depth of the search tree before moving on to nodes at next depth.

3) Iterative deepening search: this involves repeatedly performing depth limited searches with increasing depth limits until a soln. is found.

4) Best-first search: involves selecting the most promising node at each step of the search based on a heuristic function that estimates the distance to the goal. this is best when search space is large.

5) A* search :- a variant of BFS that takes into account both the distance to the goal & the cost of the path taken to reach the current node. This strategy is used in path finding applications.

Overall, search strategy will depend on the specific problem being solved & the characteristic of the search space.

→ Problem characteristics :-

The characteristics of a problem in AI can have a significant impact on the choice of algo for solving it. Some characteristics of problems in AI are

1) Search space :- size of space (search) can have a significant impact on the efficiency of a search algo. Large search spaces may require more sophisticated algos.

2) Degree of difficulty :- some are inherently more difficult than others. & may require more powerful algos. depends of size of search space, the complexity of problem constraints.

3) Availability of Domain knowledge :- if available can be used to guide the search & reduce the no. of nodes that need to be explored.

→ Production system characteristics

These are a type of rule-based system that are widely used in AI. Some

1) Modularity :- these are highly modular, with each rule representing a separate module that can be easily modified or replaced as needed.

2) Transparency :- are highly transparent, with each rule representing a specific piece of knowledge or logic, thus making it easier to understand how the system is making the decisions.

3) Flexibility :- as it allows to add or remove rules as needed.

Overall, understanding the characteristics of problems & production systems in AI is important for selecting the right approach.

to solve a problem or design an AI system.

→ Specialised production system

a rule based system. i.e., used to solve a specific class of problems. used in AI applications where problem domains are well understood & can be described using a set of well defined rules.

Ex: Expert diagnosis & planning systems.

Expert systems:- these are systems designed to mimic decision-making ability of a human expert in a particular domain. Are typically built by capturing the knowledge & expertise of human experts in a set of rules or a knowledge base.

Diagnosis systems:- used to diagnose faults or problems in a complex system. Use a set of rules or a knowledge base to identify the possible causes of a problem based on observed system or behavior.

Planning systems are a type of specialized system that are designed to generate plans or sequences of actions to achieve a particular goal or objective. These systems typically use a set of rules or a knowledge base to model the problem domain & generate plans that are optimal or near-optimal based on some criteria.

Overall, specialised production are a powerful tool in AI for solving specific

Types of problems in a wide range of domains. By carefully designing & implementing these systems, it is possible to achieve high levels of accuracy & efficiency in problem solving & decision making.

—◡ The end ◡—

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