

Foundations of AI (2): Symbolic/non-symbolic AI & Intelligent agents

2B: Define the terms 'inference', and 'expert system' (Be concise!).

Inference: is a process of coming up with new propositions and checking whether they fit with the logic of a knowledge base

Expert Systems: Are an AI system that replace experts such as insurance agent or loan officer, can explain its decisions by showing which parts were evaluated as true or false

2c : Are artificial neural networks (ANNs) similar to the human brain? Support your answer with arguments.

There are some differences indeed between human brain and ANNs such as

Size: Human brain has 86 billion Neurons in them while ANNs have 10-1000 neurons in them

Learning: Human brain can tolerate ambiguity , ANNs are very precise and structured data , required to practice ambiguity

Topology: Human brain has a complex topology with asynchronous connections , ANNs topology has tree patterns with layers

Source : <https://www.verzeo.com/blog-artificial-neural-network-vs-human-brain>

2d: An ANN uses a a) symbolic or b) non-symbolic approach to AI? Select one of the options, and explain your choice

Non symbolic , because the ANNs require the ability to learn from database that it has, it needs a huge amount of data and by intensive tries it could come up with a prediction which is a symbol, while Symbolic require an input of symbols and relations

2e Can you think of a real-life scenario where an AI method that uses a symbolic approach would be more suited than a method that uses a non-symbolic approach? Explain your answer.

If my laptop windows system Crashes there are two ways to fix it (Symbolic way and non-Symbolic way)

Non-Symbolic way: try to dig in the windows files , deleting and adding files based on my knowledge base , trying and trying again , learning from my trials , it could take hours but eventually I will fix by myself (by trying all the possibilities that I have “which is data”) and come up with a new symbol which is the solving variable ,

Symbolic way Fix (Rami,Laptop,Windows-CD), here by I have clear symbols of the issue and object and solving (**Proposition**), so using my logic , I will be able to fix my laptop using the CD

3c IBM's Deep Blue uses a a) symbolic or b) non-symbolic approach to AI? Select one of the options, and explain your choice.

It uses Symbolic approach to Ai , because its doesn't learn or guess , its all by logic, facts , rules and Rigid

3d Two intelligent agents are playing chess with a clock. One of them is called 'Deep Blue', while the other is called Gary Kasparov. Roughly specify the task environment for Deep Blue (this means you will have to specifying each letter in PEAS), and determine each of the following properties of this task environment:

- 1 A, because the fact that DB moving the pieces so accurate is just observable
- 2 Deterministic, because it has facts and rules it doesn't think or learn
- 3 sequential, because whenever the Gary Kasparov move a piece , DB make the following move
- 4 static, because DP can no take guesses
- 5 Discrete, because it goes step by step , so piece by piece
- 6 ..

3e Provide an example of an intelligent agent, and give a PEAS description of the task environment, and characterize it in terms of the properties listed in Section 2.3.2 (p. 117) in AIMA.

Agent is Automated Car Drive ,

Performance Measure : Comfortable trip , Safety , Maximum resistance

Environment : Roads, Traffic , Vehicles

Actuator : Steering wheel , accelerator , brake , mirror

Sensor: Camera , gps , odometer

3f Compare and contrast the following agent types:

-Simple Reflex : take decisions on the basis of the current percepts and ignore the rest of the percept history

- - These agents only succeed in the fully observable environment.
- The Simple reflex agent works on Condition-action rule, which means it maps the current state to action. Such as a Room Cleaner agent, it works only if there is dirt in the room
Problems for the simple reflex agents are :
 - They have very limited intelligence
 - They do not have knowledge of non-perceptual parts of the current state
 - Mostly too big to generate and to store.
 - Not adaptive to changes in the environment.

Model-based reflex :

- The Model-based agent can work in a partially observable environment, and track the situation.
- A model-based agent has two important factors:
 - **Model:** It is knowledge about "how things happen in the world," so it is called a Model-based agent.
 - **Internal State:** It is a representation of the current state based on percept history.
- These agents have the model, "which is knowledge of the world" and based on the model they perform actions.

Goal-based agents :

- The knowledge of the current state environment is not always sufficient to decide for an agent to what to do.

- The agent needs to know its goal which describes desirable situations.
- Goal-based agents expand the capabilities of the model-based agent by having the "goal" information.
- They choose an action, so that they can achieve the goal.

Utility-based Agents

- These agents are similar to the goal-based agent but provide an extra component of utility measurement which makes them different by providing a measure of success at a given state.
- Utility-based agent act based not only goals but also the best way to achieve the goal.
- The Utility-based agent is useful when there are multiple possible alternatives, and an agent has to choose in order to perform the best action.
- The utility function maps each state to a real number to check how efficiently each action achieves the goals.