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① Baysian Network → is a probabilistic graphical model that represent a set of random variables & their probabilistic dependencies through a directed Acyclic graph (DAG)

Key components

i) Nodes - each node in baysian network rep a random variable.

ii) Edges - directed edges betw^n node represent probabilistic dependencies.

iii) DAG - str of Baysian network is represented by direct Acyclic graph

iv) parent & child node - parent are nodes with directed edges leading to it, children lead away from it.

② Dempster-shafer Theory (DST) → also known as evidence Theory or belief function Theory. It's powerful framework in AI for dealing with uncertainty & reasoning with incomplete information.

- It is mathamatical framework for representing and manipulating degrees of belief

Applications, i) sensor fusion - combines data from multiple sensors to form a more accurate pic of environment

ii) Expert system - Aggregating knowledge & opinions to make informed decisions

iii) NLP - Dealing with ambiguites.

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③ Fuzzy set - Fuzzy sets are like flexible buckets that hold ideas, not just yes or no answers

- It's a collection of elements with varying degree of membership, instead of strict "in" or "out"
- each element has a membership degree, a no betw^n 0 (not a member at all) and 1 (fully a member).

useful in AI?

1) controlling traffic light → fuzzy logic can adjust light duration based on traffic volume and time of day, not just fixed timers.

2) Robot Navigation → used to decide safest path

3) medical diagnosis → can analyze complex medical data and consider various factor to give more nuanced diagnoses.

④ Fuzzy logic - Fuzzy logic in AI is a way of reasoning that allows for imprecise and ambiguos information, unlike traditional logic's strict "true or false" approach.

- more natural and human-like reasoning. It handles ambiguity and uncertainty like humans do
- Robust to noise & error
- Flexibility & adaptability
- can be complex to design and implement

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Q. Component of a planning system in ai.

→ The component of a planning system in AI are

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Q. Goal stack planning.

→ - Goal stack planning is one of the earliest methods in artificial intelligence in which we work backwards from the goal state to the initial state.

- we start at the goal and we try fulfilling the preconditions required to achieve the initial state. These preconditions in turn have their own set of preconditions, which are required to be satisfied first. we keep solving these "goals" and "sub-goals" until we finally arrive at the Initial state.
- we make use of a stack to hold these goals that needs to be fulfilled as well the actions that we need to perform for the same.

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Q. Hierarchical planning

→ → Hierarchical planning in artificial intelligence (AI) is a planning approach that involves organizing tasks and actions into multiple levels of abstraction or hierarchy, where higher-level task are decompared into a sequence of lower-level task

→ Hierarchical can be organized as a tree or a directed acyclic graph with the high level goals as the root node at the lowest-level tasks or actions as a leaf node.

* components of Hierarchical planning

- High-level goals
- Task decomposition
- Planning hierarchy
- Plan generation at different levels
- Plan synthesis
- Plan execution.

* Techniques

- Decomposition
- Abstraction
- Task allocation
- Plan integration.

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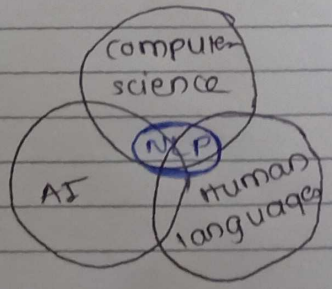
① Natural language processing

- Natural language processing (NLP) refers to AI method of communication with an intelligent system using a natural language such as english.

- processing of natural language is required when you want an intelligent system like robot to perform as per your instructions, when you want to hear decision from a dialogue based clinical expert system, etc

- gives ability to read understand & derive meaning from human languages

Has two main components
- NL understanding
- NL generation



NLP terminology

- Phonology
- morphology
- morpheme
- syntax
- semantics
- pragmatic
- world knowledge

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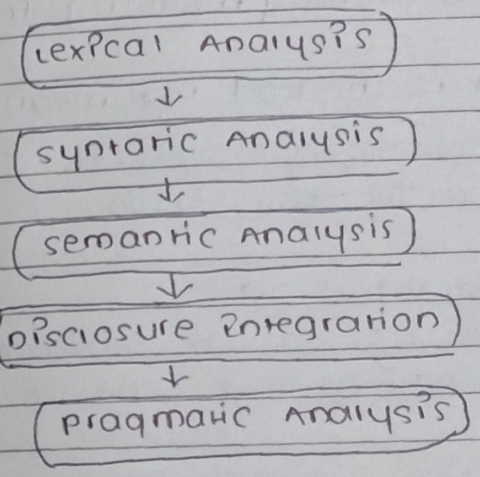
- steps in NLP



(i) Lexical Analysis → • It involves identifying and analyzing the str of words
• lexicon of a language means the collection of words and phrases in a languages
• lexical analysis is dividing the whole chunk to text into paragraphs, sentences and words.

(ii) Syntatic Analysis → • It involves analysis of words in the sentence for grammer and arranging words in a manner that shows the relationship among words.
• " The school goes to boy" is rejected by english syntatic analyser.

(iii) Semantic Analysis ⇒ draws the exact meaning or dictionary meaning from the text.

- Text is checked for meaningfulness.

It is done by mapping syntactic structures and objects in the task domain.

iv) Discourse Integration :→

- The meaning of any sentence depends upon the meaning of sentence just before it.
- In addition, it also brings about the meaning of immediately succeeding sentence.

v) Pragmatic Analysis :-

- During this, what was said is re-interpreted on what it actually meant.
- It involves deriving those aspects of language which require real world knowledge

Q.2. What is Syntactic Processing ?

→ - Syntactic processing is the process of analyzing the grammatical structure of a sentence to understand its meaning.
- This involves identifying the different parts of speech in a sentence, such as nouns, verbs, adjectives, and adverbs.
- and how they relate to each other in order in order to give proper meaning to the sentence.

Q.3. What is Semantic Analysis ?

→ - Semantic analysis is the process of drawing meaning from text.
- It allows computers to understand and interpret sentences, paragraphs, or whole documents by analyzing their grammatical structure.
- Semantic analysis-driven tools can help companies automatically extract meaningful information from unstructured data.

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Q.4. Inductive learning.

→ - Inductive learning is Discovering patterns and making predictions.
- Inductive learning is powerful technique in ai that allows machines to learn from specific example and generalize that knowledge to new situations.

Application of Inductive learning:
- Image recognition
- Natural language processing
- Recommender systems
- Fraud detection.

Q.5. Learning Decision tree.
- A powerful tool for making decisions
- Decision trees are fundamental and widely used technique in AI for making predictions and classifications based on data. They excel in their simplicity, interpretability, and ability to handle complex relationships between features and outcomes.

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Q.6. Explanation Based Learning.

→ - Explanation Based learning is a unique approach in AI that focuses on understanding the underlying reasons for observed outcomes rather than simply memorizing patterns.
- Unlike traditional machine learning methods that learn solely from data Explanation Based learning leverages existing domain knowledge to explain specific examples and then generalize that explanation to new situations.
- Examples: Medical diagonsis, Robotics.

Q.7. learning using relevance information.

Q.8. Neural net learning.

→ — A powerful type of machine learning model inspired by the structure and function of the human brain.

— Their learning process involves adapting and optimizing internal connections to improve performance on specific task.

— Neural net learning : How Artificial Brain get smarter.

— e.g. Types of Neural net learning :
i) supervised ii) unsupervised iii) Reinforcement.

— e.g: Image recognition, Robot control, Natural language processing.

Q.9. Genetic learning.

— means Evolving solutions like Nature.

— suppose we have a garden full of different flowers, each with unique colours, shapes and smell. You want to breed the most beautiful flower possible. That's kind of like what genetic learning does in AI, but instead of flowers, it's dealing with algorithms and solutions!

— e.g. Robot control, Image recognition.

Q.10. Representing and using domain knowledge.

→ — Bridging the Gap Between Data and Understanding.

— Suppose we are building robot chef. It needs to know how to cook different dishes, and that means understanding ingredients, recipes, and the kitchen world. That's domain knowledge, and in AI, we need to represent and use it effectively for our machines to perform well.

Q.11. Knowledge acquisition and Expert system.

→ ii) Knowledge acquisition :
This is where the magic happens! It's process of gathering and formalizing the knowledge needed by the expert system. Think of it like filling the shell's brain with the expertise it needs to function.

i) Expert System :
Imagine a super-smart friend who knows everything about a specific topic like cars. An expert system in AI is like that friend, but it's computer program. It has a huge brain filled with knowledge and rules about a specific area.