Sheet1- Introduction to Artificial Intelligence

Logic Programming and Prolog

intelligence is a multifaceted mental quality that encompasses various abilities. It involves:

1. **Reasoning**: The capacity to think <u>logically</u> and <u>abstractly</u>.

2. **Learning**: The ability to <u>acquire</u> and <u>retain</u> knowledge.

3. **Problem-solving**: The skill to address <u>challenges</u> effectively.

4. **Adaptation**: The capacity to <u>adjust to different situations</u>.

5. **Emotional knowledge**: Understanding and managing <u>emotions</u>.

6. **Creativity**: Generating <u>novel</u> ideas and solutions.

7. **Self-awareness**: Recognizing one's <u>own thoughts</u> and feelings.

intelligence isn't just about learning facts; it's about using knowledge effectively to navigate our environment and make informed decisions.

- the ability to solve novel problems
- the ability to act rationally
- the ability to act like humans

Artificial Intelligence?

- AI is the branch of science which makes the machine **exhibit intelligence** as human beings for **a particular domain**. in order words, a machine is intelligent if it **solve/perform/reason** certain classes of problems requiring intelligence in humans.
- If the machine could pass a certain test known as the **Turing test**, then system could be intelligent.

Logic Programming and Prolog

1. **Overview of Logic Programming Concepts**

- **Declarative Programming Paradigm**:
  - Logic programming takes a different approach from functional and imperative programming.
  - Programs are expressed in terms of **symbolic logic** and **logical inferences**.
  - Built over **first-order predicate calculus**.

- **Declarative Semantics**:
  - Logic programs describe **what should be accomplished**, not how to achieve it.
  - Relevant information and inference methods drive computation.

2. **What is Prolog?**

Prolog stands for **Programming Logic**.

It focuses on describing **facts** and **relationships** about problems rather than creating a series of steps to solve those problems.

Emphasis is on **what** rather than **how**.

3. **Basic Elements of Prolog**

A program consists of **clauses**.

Facts: Statements about what is true about a problem.

Facts are used to work out how to accomplish solutions by searching through the space of possible solutions.

Rules: Express dependencies among facts.

Rules consist of a **head** and a **body** connected by the symbol (:-) (IF).
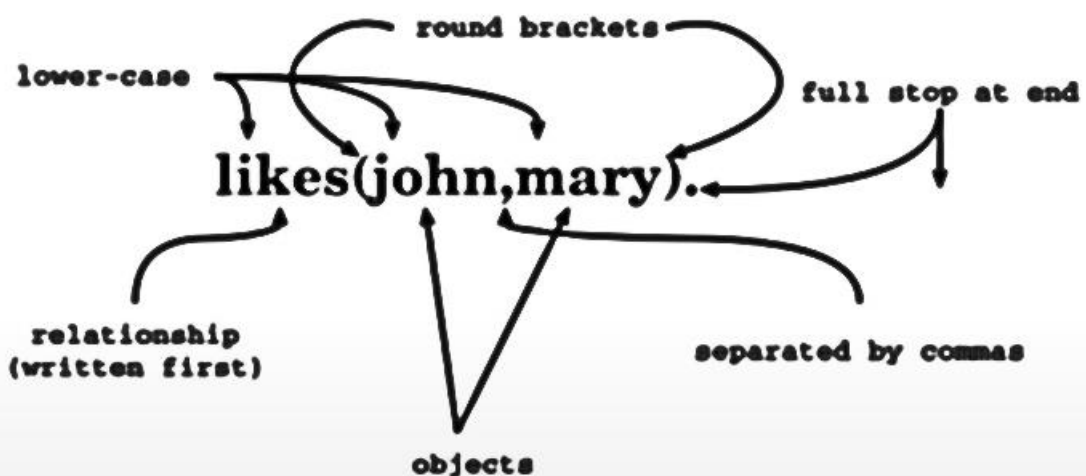
4. **Syntax for Fact Declaration**

Names of relationships and objects must begin with a lowercase letter.

Relationship (typically the predicate of the sentence) is written first.

Objects are separated by commas and enclosed in round brackets.

End each fact with a full stop (.).

5. Examples of Facts

- valuable(gold).   : Gold is valuable.
- owns(john, gold) .   : John owns gold.
- father(john, mary).   : John is the father of Mary.
- gives(john, book, mary). : John gives the book to Mary.

Facts:

- likes(joe, fish).
- likes(joe, mary).
- likes(mary, book).
- likes(albert, book).

Questions:	Answer:	
?- likes(joe, mary).	yes	
?- likes(mary, joe).	no	
?- likes(mary, mary).	no	
?- likes(joe, fish).	yes	
?- likes(joe, X).	X= fish	X= mary
?- likes(Who, fish).	??	

Note : likes(joe, mary). not equals to likes(mary, joe).

6. Use of Prolog in AI Applications

Natural language interfaces

Automated reasoning systems

Expert systems: Consist of a database of facts and rules, with Prolog's inference engine providing services.