



Introduction to Artificial Intelligence

- **Artificial Intelligence (AI)**

- Artificial Intelligence is concerned with the design of intelligence in an artificial device. The term was coined by John McCarthy in 1956.
- Intelligence is the ability to acquire, understand and apply the knowledge to achieve goals in the world.
- AI is the study of the mental faculties through the use of computational models
- AI is the study of intellectual/mental processes as computational processes.
- AI program will demonstrate a high level of intelligence to a degree that equals or exceeds the intelligence required of a human in performing some task.
- AI is unique, sharing borders with Mathematics, Computer Science, Philosophy, Psychology, Biology, Cognitive Science and many others.
- Although there is no clear definition of AI or even Intelligence, it can be described as an attempt to build machines that like humans can think and act, able to learn and use knowledge to solve problems on their own.

Foundations of Artificial Intelligence:

1. Philosophy

e.g., foundational issues (can a machine think?), issues of knowledge and believe, mutual knowledge

2. Psychology and Cognitive Science

e.g., problem solving skills

3. Neuro-Science

e.g., brain architecture



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4. Computer Science And Engineering

e.g., complexity theory, algorithms, logic and inference, programming languages, and system building.

5. Mathematics and Physics

e.g., statistical modeling, continuous mathematics, Statistical Physics, and Complex Systems.

Sub Areas of AI:

1) Game Playing

Deep Blue Chess program beat world champion Gary Kasparov

2) Speech Recognition

PEGASUS spoken language interface to American Airlines' EAASY SABRE reservation system, which allows users to obtain flight information and make reservations over the telephone. The 1990s has seen significant advances in speech recognition so that limited systems are now successful.

3) Computer Vision

Face recognition programs in use by banks, government, etc. The ALVINN system from CMU autonomously drove a van from Washington, D.C. to San Diego (all but 52 of 2,849 miles), averaging 63 mph day and night, and in all weather conditions. Handwriting recognition, electronics and manufacturing inspection, photo interpretation, baggage inspection, reverse engineering to automatically construct a 3D geometric model.

4) Expert Systems

Application-specific systems that rely on obtaining the knowledge of human experts in an area and programming that knowledge into a system.

a. Diagnostic Systems : MYCIN system for diagnosing bacterial infections of the blood and suggesting treatments. Intellipath pathology diagnosis system (AMA approved). Pathfinder medical diagnosis system, which suggests tests and makes diagnoses. Whirlpool customer assistance center.



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b. System Configuration

DEC's XCON system for custom hardware configuration. Radiotherapy treatment planning.

c. Financial Decision Making

Credit card companies, mortgage companies, banks, and the U.S. government employ AI systems to detect fraud and expedite financial transactions. For example, AMEX credit check.

d. Classification Systems

Put information into one of a fixed set of categories using several sources of information.

E.g., financial decision making systems. NASA developed a system for classifying very faint areas in astronomical images into either stars or galaxies with very high accuracy by learning from human experts' classifications.

5) Mathematical Theorem Proving

Use inference methods to prove new theorems.

6) Natural Language Understanding

AltaVista's translation of web pages. Translation of Caterpillar Truck manuals into 20 languages.

7) Scheduling and Planning

Automatic scheduling for manufacturing. DARPA's DART system used in Desert Storm and Desert Shield operations to plan logistics of people and supplies. American Airlines rerouting contingency planner. European space agency planning and scheduling of spacecraft assembly, integration and verification.

8) Artificial Neural Networks:

9) Machine Learning