UNIT 1: Introduction to Artificial Intelligence

1. What is Intelligence?

Definition

Intelligence is the ability of an entity to **learn from experience, understand information, reason logically, solve problems, adapt to new situations, and make decisions to achieve goals**.

Key Characteristics of Intelligence

Aspect	Description
Learning	Acquiring knowledge from data or experience
Reasoning	Drawing conclusions using logic
Problem-solving	Finding solutions to complex situations
Adaptability	Adjusting to new or changing environments
Perception	Interpreting sensory input (vision, sound, etc.)
Decision-making	Choosing the best action among alternatives

Human Intelligence vs Machine Intelligence

Human Intelligence	Machine Intelligence
Emotional & creative	Logical & data-driven
Learns from experience naturally	Learns from data & algorithms
General-purpose	Mostly task-specific
Can understand context	Limited contextual understanding

Example

- **Human intelligence:** A doctor diagnosing a disease based on symptoms and experience.
- **Machine intelligence:** An AI system diagnosing diseases using medical data and patterns.

2. What is Artificial Intelligence (AI)?

Definition

Artificial Intelligence (AI) is a branch of computer science that focuses on creating machines capable of performing tasks that normally require **human intelligence**, such as learning, reasoning, problem-solving, perception, and language understanding.

Formal Definitions (Exam-Oriented)

- **John McCarthy (1956):**
  "Artificial Intelligence is the science and engineering of making intelligent machines."
- **Russell & Norvig:**
  "AI is the study of agents that perceive their environment and act rationally."

Goals of AI

- To create **intelligent agents**
- To automate intelligent tasks
- To simulate human thinking and behavior
- To improve efficiency and accuracy in decision-making

3. Foundations of Artificial Intelligence

AI is an **interdisciplinary field** built on multiple disciplines.

Major Foundations of AI

Discipline	Contribution to AI
Mathematics	Logic, probability, statistics, optimization
Computer Science	Algorithms, data structures, programming
Philosophy	Logic, reasoning, ethics
Psychology	Learning, cognition, behavior
Neuroscience	Brain functioning, neural networks
Linguistics	Natural Language Processing (NLP)
Control Theory	Robotics and automation
Economics	Decision theory, game theory

Example

- **Neural Networks** ← inspired by **human brain neurons**
- **Search algorithms** ← based on **logical reasoning**

4. History of Artificial Intelligence

Early Foundations (Before 1950)

- **Aristotle:** Formal logic and reasoning
- **Alan Turing (1950):** Proposed the **Turing Test** to measure machine intelligence

Birth of AI (1956)

- Term **"Artificial Intelligence"** coined by **John McCarthy**
- **Dartmouth Conference (1956)** marked the official beginning of AI

AI Timeline

Period	Key Developments
1950–1960	Logic-based programs, problem solving
1960–1970	Expert systems, symbolic AI
1970–1980	First AI Winter (lack of computing power)
1980–1990	Knowledge-based systems
1990–2000	Machine learning, data-driven approaches
2000–2010	Big data, statistical AI
2010–Present	Deep learning, generative AI

Key Milestones in AI

Year	Event
1950	Turing Test
1956	Dartmouth Conference
1997	IBM Deep Blue defeats Garry Kasparov
2011	IBM Watson wins Jeopardy
2012	Deep Learning breakthrough (ImageNet)
2020+	ChatGPT, Generative AI, Autonomous systems

5. Examples of AI in Real Life

Application	AI Use
Voice Assistants	Speech recognition & NLP
Recommendation Systems	ML-based predictions
Self-driving cars	Computer vision & decision-making
Healthcare	Disease diagnosis
Finance	Fraud detection

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6. Relationship Between AI, ML, and DL

Artificial Intelligence
└── Machine Learning
    └── Deep Learning

- **AI:** Broad concept
- **ML:** Learning from data
- **DL:** Neural networks with many layers

Term	The Simple Goal	Real-World Example
Data Analytics	To explain **what happened** in the past.	"Our sales dropped by 10% last month because of the rain."
Data Science	To find **hidden insights** and build tools to solve problems.	Building a system that identifies which customers are likely to leave next month.
Big Data	To handle **massive amounts** of data that won't fit on one computer.	Processing the billions of transactions processed by Visa every day.
Machine Learning	To **predict** the future based on past data.	Netflix recommending a movie you might like.
Generative AI	To **create** something brand new.	Asking an AI to "Write a poem about a robot eating a taco."

Reels Ki Dunia

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