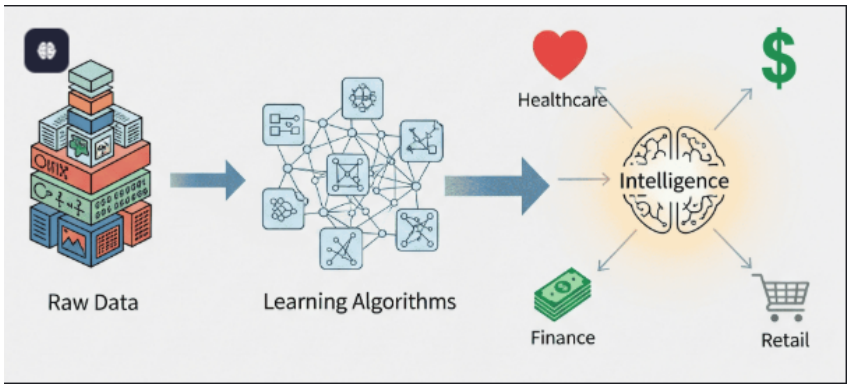
Machine Learning

What is Machine Learning (ML)?



Machine Learning (ML) is a part of **Artificial Intelligence (AI)**.

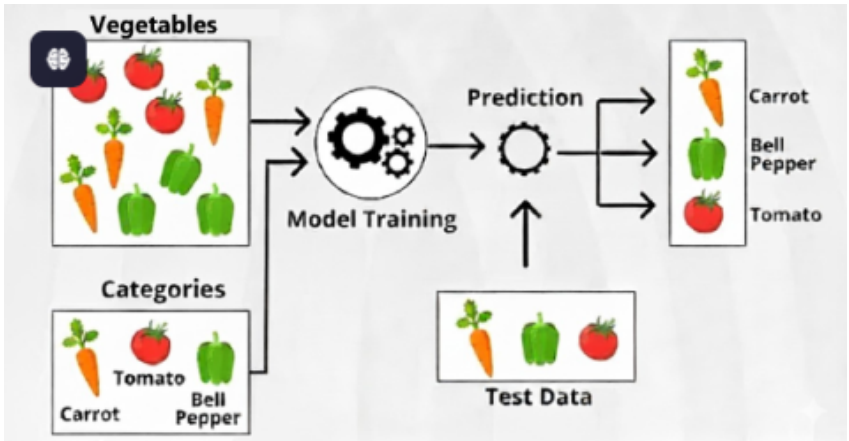
It helps computers **learn from data** instead of following fixed rules.

The system improves automatically when it sees more data.

ML uses **past data** to make predictions on **new, unseen data**.

👉 Example:
Instead of writing rules to detect spam emails, we show examples of spam and non-spam emails. The computer learns the pattern.

How Machine Learning Works



We **give examples (data)** to the computer.

The computer finds **patterns** in the data.

It uses these patterns to **predict future results**.

No need to write every rule manually.

🧠 Think of it like teaching a child using examples, not rules.

📊 When Patterns Get Complicated

Example: Predicting Exam Marks

Study Hours	Sleep Hours	Attendance	Marks
1	6	80%	45
2	5	90%	50
3	7	85%	65
4	6	70%	68
5	4	95%	72

Why This Is Hard

- Many factors affect marks at the same time.
- Data does **not follow a straight pattern**.
- Some factors depend on each other.
    - Too little sleep ❌
    - Too much sleep ❌

How ML Helps

- Finds patterns **automatically**.
- Works with:
    - Many inputs together
    - Messy or missing data
    - Complex relationships humans may miss

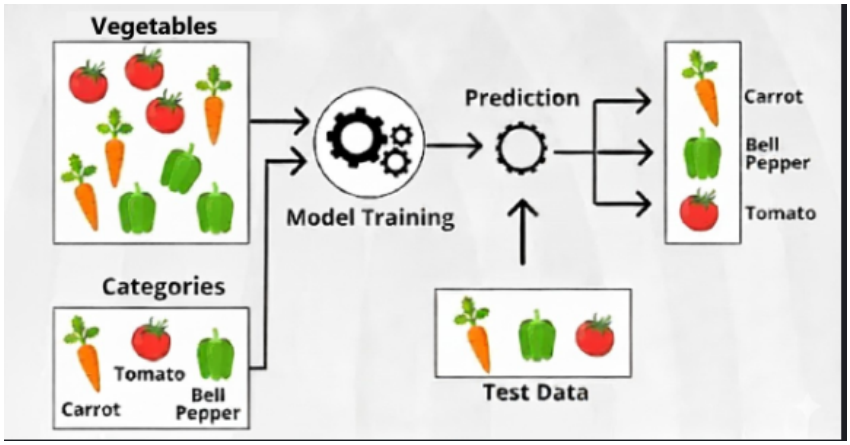
🧠 Different Ways Machines Can Learn

Just like humans, machines also learn in different ways.

Learning Styles Analogy

- **Kid A** → Learns with answers → **Supervised Learning**
- **Kid B** → Groups similar things → **Unsupervised Learning**
- **Kid C** → Learns by trial & error → **Reinforcement Learning**

🧑🏫 Supervised Learning



- Data is **labeled** (input + correct output).
- The model learns the relationship between input and output.
- Used for **prediction and classification**.

Example

- 🥕 → Carrot
- 🍅 → Tomato

- □ → Bell Pepper

The model learns and later identifies **new vegetables correctly**.

📂 Dataset & Training Process

Example Dataset (Fruits)

Weight (g)	Sweetness (1–10)	Label
150	8	Apple
170	7	Apple
130	9	Apple
200	4	Orange
220	3	Orange
210	5	Orange

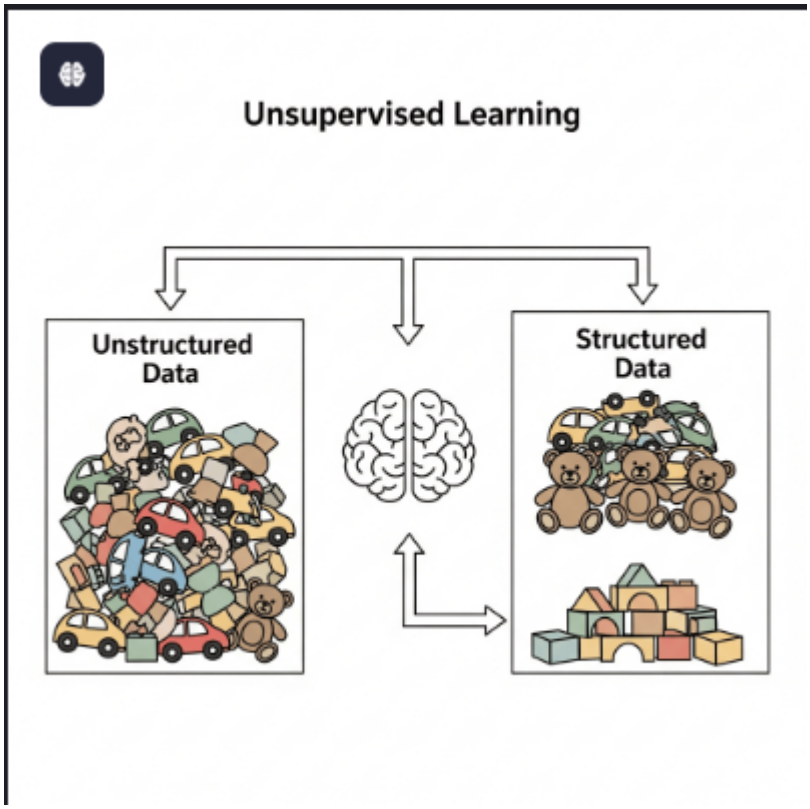
Important Terms

- **Features** → Weight, Sweetness
- **Label** → Apple / Orange
- **Training** → Showing many examples to the model

After Training

- New fruit:
  - Weight = 160g
  - Sweetness = 8
- Model predicts: **Apple** 🍎

🧩 Unsupervised Learning



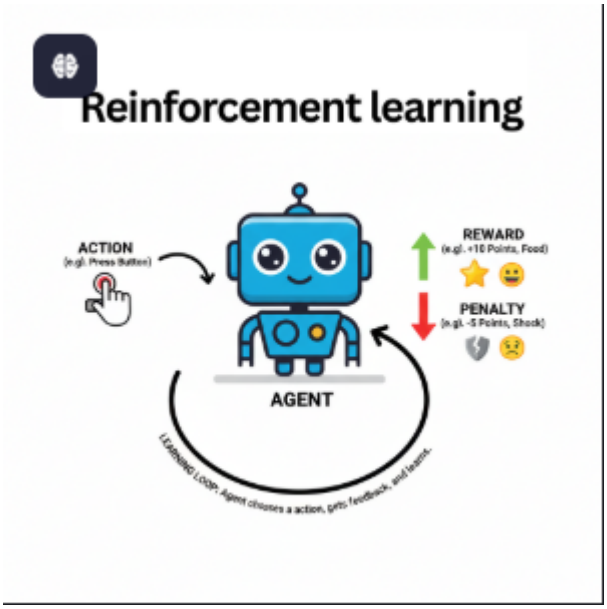
- Data has **no labels**.
- The model finds patterns or groups on its own.
- Mainly used for **clustering**.

Example: Grouping Toys

- Cars → Group 1
- Teddy Bears → Group 2
- Legos → Group 3

No one tells the machine what is what—it figures it out.

🎮 Reinforcement Learning



Why Reinforcement Learning?

- No labeled data
- No grouping
- Learning happens by **doing actions**

How It Works

- An **agent** takes an action
- The environment gives:
  - ✅ Reward (good action)
  - ❌ Penalty (bad action)
- The agent learns by **trial and error**

Example

- AI playing a game
- Robot learning to walk
- Self-driving cars

✨ This is a **core pillar of AI and Deep Learning**

📝 Quick Summary

- **Machine Learning** = Learning from data

- **Supervised Learning** = Labeled data
- **Unsupervised Learning** = No labels, find patterns
- **Reinforcement Learning** = Learn by rewards & penalties

Just tell me 👍