Machine Learning – Day 1 Notes

Types of Learning in Machine Learning

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1. Initial Understanding

Initially, I believed that **Machine Learning was mainly about selecting the right algorithm**.
This view changed after understanding how **different systems learn from data**.

2. Core Insight

Machine Learning is **not a single concept**.

It is defined by **how a system learns from data**, not just by the algorithm it uses.
The **learning approach** determines:

- How data is prepared

- What kind of feedback is available

- Which algorithms are suitable

The type of learning matters more than the algorithm itself.

3. Types of Machine Learning

A. Supervised Learning

Learning with labeled data

In supervised learning:

- The dataset contains **inputs with correct answers (labels)**

- The model learns by comparing its predictions with the actual answers

- Errors are used to improve performance

Real-life examples:

- **Email spam detection**
  Emails are labeled as "Spam" or "Not Spam"

- **House price prediction**
  Past house data includes size, location, and actual selling price

- **Medical diagnosis systems**
  Patient data with known disease outcomes

Key idea:
The model learns with guidance, similar to a student learning from a teacher.

B. Unsupervised Learning

Learning without labeled data

In unsupervised learning:

- No correct answers are provided

- The system identifies **patterns, similarities, or structures**

- The goal is understanding data rather than prediction

Real-life examples:

- **Customer segmentation in marketing**
  Grouping customers based on purchase behavior

- **Organizing photos on a smartphone**
  Automatically grouping similar faces or scenes

- **Market basket analysis**
  Finding products that are frequently bought together

Key idea:
The model explores data on its own and discovers hidden patterns.

C. Reinforcement Learning

Learning through interaction and feedback

In reinforcement learning:

- The model takes actions in an environment
- Each action results in a **reward or penalty**
- The goal is to maximize long-term rewards

Real-life examples:

- **Game-playing AI** (chess, video games)
  Learning strategies by winning or losing

- **Self-driving cars**
  Learning safe driving behavior through continuous feedback

- **Robotics**
  Learning how to walk or pick objects through repeated attempts

Key idea:
The system improves by learning from experience and consequences.

4. Shift in Perspective

Earlier View

Machine Learning is mostly about:

- Choosing algorithms like Linear Regression, KNN, or Decision Trees

Updated Understanding

Machine Learning starts with:

- Understanding the **problem**

- Identifying the **type of learning**

- Then selecting an appropriate algorithm

The algorithm is a **tool**, not the foundation.

5. Final Takeaway

Understanding **how learning happens** makes Machine Learning:

- More logical

- More structured

- Less intimidating

Learning approach → Data → Algorithm → Model