Machine Learning: Supervised vs Unsupervised Learning

What is Machine Learning?

Machine Learning (ML) is when computers learn from data — instead of being programmed with fixed rules.

We give data to the machine, and it finds patterns or makes predictions based on that data.

1. **Supervised Learning**

Definition: In supervised learning, the model learns from labeled data — which means we already know the answers (output values).

Think of it like a teacher supervising the learning process.

Example:

Hours Studied	Marks Scored
2	40
4	60
6	80

The model learns the relationship between "hours studied" (input) and "marks scored" (output). Later, it can predict marks for a new student who studied 5 hours.

Common Algorithms:

Linear Regression

Decision Trees

Random Forest

Support Vector Machines (SVM)

Neural Networks

Used for:

Predicting sales, prices, or scores (Regression)

Classifying emails as spam or not spam (Classification)

2. Unsupervised Learning

Definition: In unsupervised learning, the data is unlabeled — there are no answers given. The model has to find patterns or groups on its own.

It's like giving students a bunch of puzzle pieces without showing them the final picture.

Example:

Imagine you have customer data — age, income, and spending — but no labels.
The algorithm can group customers with similar behavior together (e.g., high-income big spenders, low-income minimal spenders).

Common Algorithms:

K-Means Clustering

Hierarchical Clustering

Principal Component Analysis (PCA)

Used for:

Customer segmentation

Market basket analysis

Detecting anomalies or patterns

Feature	Supervised Learning	Unsupervised Learning
Data	Labeled (known output)	Unlabeled (unknown output)
Goal	Predict outcomes	Find hidden patterns or groups
Example	Predict house prices	Group customers by buying habits
Type of Problems	Classification & Regression	Clustering & Association

Supervised Learning → Like learning with an answer key.

Unsupervised Learning → Like exploring without a map to find patterns yourself.