Understanding Machine Learning, Features, Labels, and Data:

Machine Learning (ML):

Machine Learning is a technique that enables computers to learn from data without being explicitly programmed.

Instead of writing detailed instructions, we provide data to the computer, and it learns patterns from that data to make future predictions or decisions.

Features:

Features are the input variables or columns in the dataset that the model uses to learn.

They provide the information based on which the model understands the patterns in the data.

Example:

If we want to predict the price of a car, the following can be features:

Brand of the car

Model

Engine size

Year of manufacture

These inputs help the model understand what affects the car's price.

Label:

The label is the output or result that we want the model to predict.

It is the target variable — the value the model is trying to learn or estimate.

Example:

*In the car price prediction example, the **"Price"** is the label, since it is the value we are trying to predict based on the features.*

Example Table:

| Brand | Model | Year | Engine Size | Price |

| ------ | ------- | ---- | ----------- | --------- |

| Honda | Civic | 2020 | 1.8L | 2,500,000 |

| *Toyota* | *Corolla* | *2021* | *1.6L* | *2,700,000* |

Features: *Brand, Model, Year, Engine Size*

Label*: Price*

Types of Data in Machine Learning:

Machine Learning models work with two main types of data:

1. Labeled Data (Used in Supervised Learning):

This data contains both inputs (features) and outputs (labels).

The model is trained on this data by learning the relationship between features and labels.

Example*: Predicting student marks based on study hours. You know both the number of hours studied (feature) and the marks scored (label).*

2. Unlabeled Data (Used in Unsupervised Learning):

This data contains only inputs (features), with no corresponding outputs (labels).

The model uses this data to identify hidden patterns or groups without any specific target.

Example*: Grouping customers based on their age, location, and spending habits, without knowing their category or type in advance.*

Main Types of Machine Learning:

| *Type of Learning* | *Common Use Cases* | *Label Available?*

| --- | --- | ---

| *Supervised Learning* | *Predictions (marks, price, etc.)* | *Yes*

| *Unsupervised Learning* | *Grouping (clustering, segments)* | *No*

| *Reinforcement Learning* | *Games, robotics, automation* | *Based on feedback*

Summary:

Machine Learning means teaching a computer using data instead of hardcoding instructions.

Features are the input columns that provide information.

Label is the output or answer we want the model to predict.

Data acts like a teacher for the model.

Labeled Data includes both features and labels.

Unlabeled Data contains only features, with no known outputs.