1. Instance-Based Learning

- Also called **memory-based** or **lazy learning**.

Meaning (Easy):

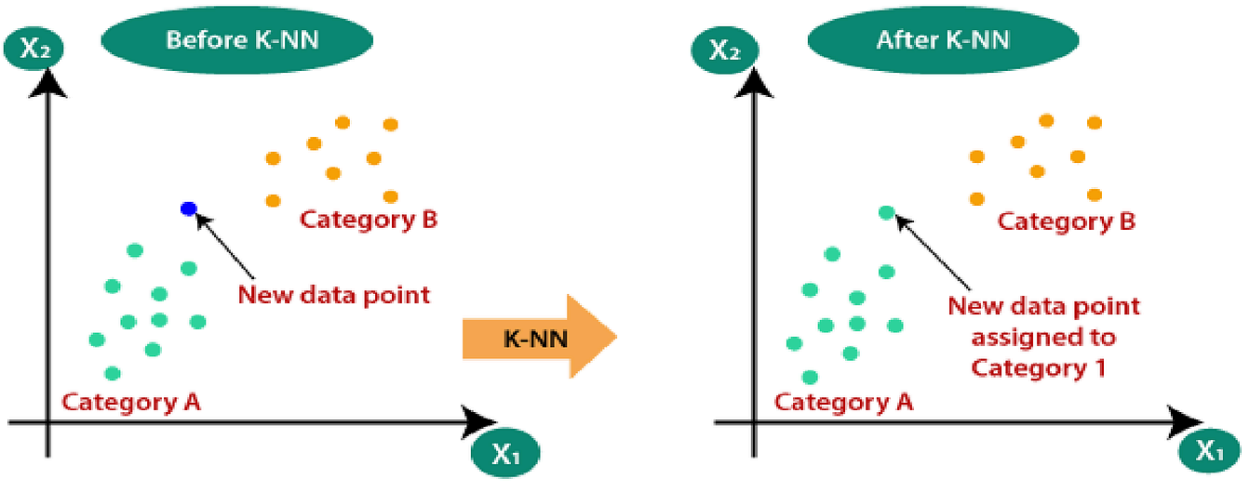
- The system doesn't build a general model upfront.
- It **memorizes** all training data
- When it sees a new input, it compares it with stored examples and uses the **closest matches** to decide the output.

Key Points:

- **No explicit model built.**
- Learning happens **when prediction is requested**, not before.
- Works by **comparing similarities** between the new data and stored examples.

Example:
Methods : KNN Method

Fruit	Color	Label
Red	Round	Apple
Yellow	Long	Banana



2. Model-Based Learning

- Also known simply as **model learning** or **eager learning**

Meaning (Easy):

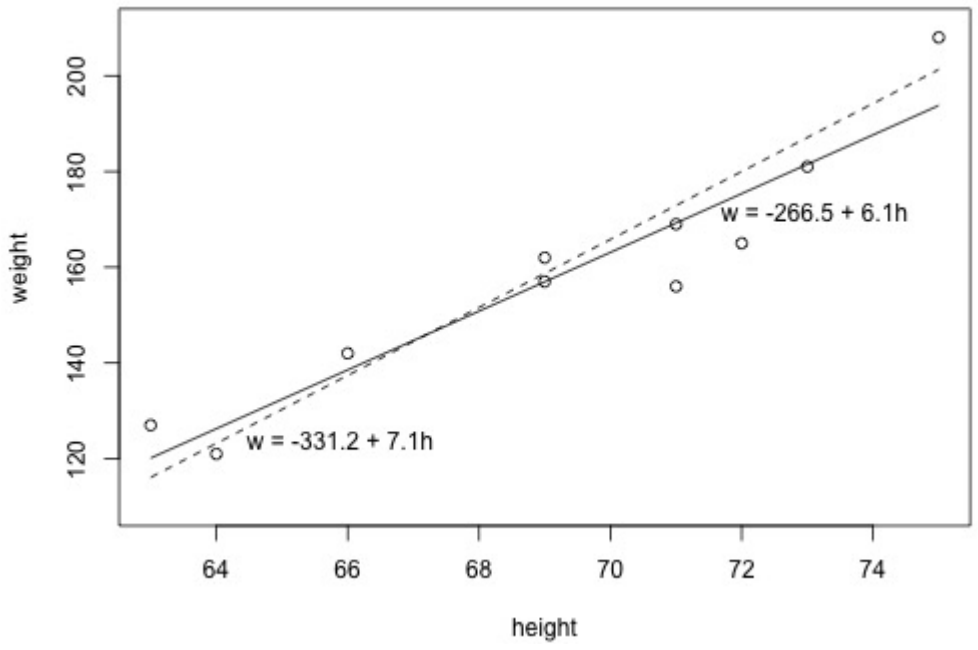
- Instead of remembering every example, this approach builds a **general model** during training.
- The model has parameters learned from the data.
- For new inputs, the model uses these parameters to make predictions directly.

Key Points:

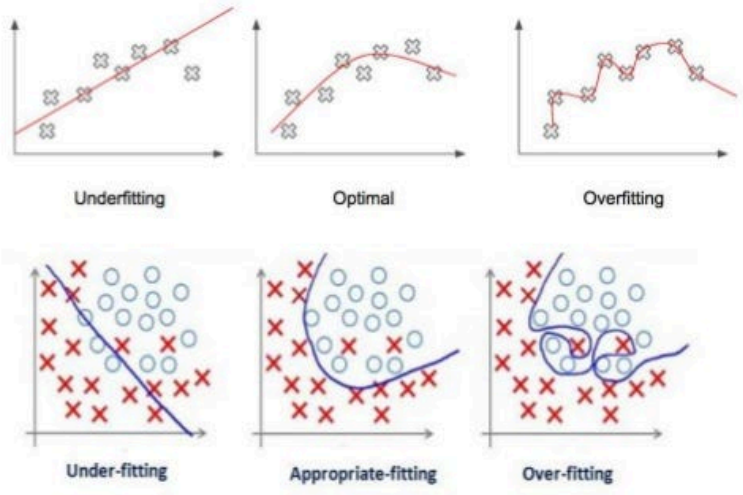
- **Model is learned before prediction.**
- Predictions are **fast** once the model is ready.
- Model encapsulates the **general rule** behind data rather than storing every example

Example: Methods: Linear Regression, Decision tree

In linear regression we build a model:
y = m*x + c
From training points, we determine the best **m** and **c**, then use these for future predictions



Overfitting and Underfitting:



When to Use Which

Use Instance-Based When:

- Dataset is small
- You want flexible local behavior
- Model simplicity is preferred

Use Model-Based When:

- Prediction must be fast
- Generalization across data patterns is needed
- Training time is acceptable

Strengths and Weaknesses

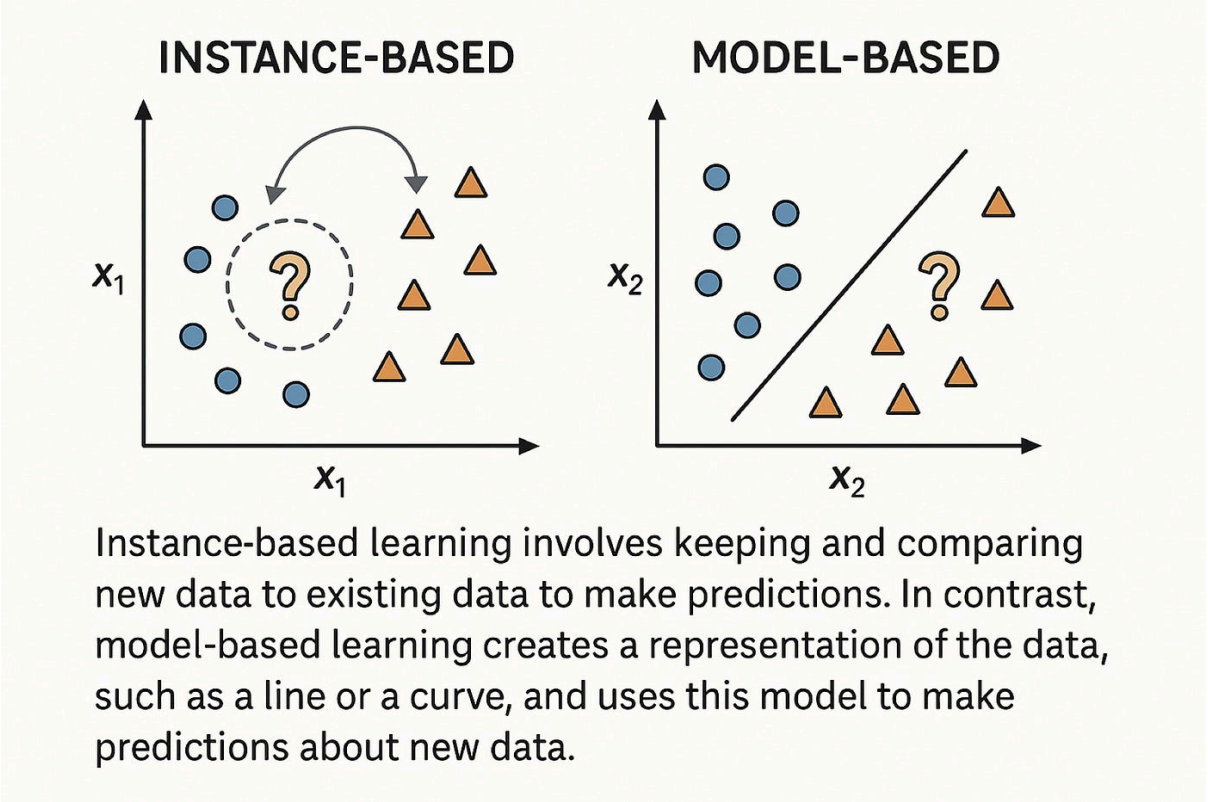
Instance-Based

- **Strength:** Adapts to local details
- **Weakness:** Slow at prediction if data is huge

Model-Based

- **Strength:** Fast prediction, compact
- **Weakness:** Model may oversimplify complex patterns

IN SHORT:



- **Instance-Based Learning** predicts by comparing new data with stored examples.
- **Model-Based Learning** predicts using a learned mathematical model.